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THE IRON AGE

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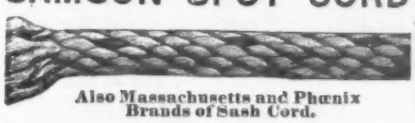

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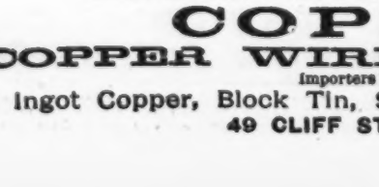
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THE IRON AGE

THURSDAY, JUNE 11, 1903.

The Inefficiency of the Ordinary Lathe for High Speed Cutting.*

BY H. M. NORRIS, CINCINNATI, OHIO.

During the discussion of one of the papers read at our last meeting I stated that for turning shafting with Novo steel the gradation of speeds on the ordinary lathe is far too rapid, that there should be less difference between successive cone steps, and that for work between 1 and 4 inches the ratio of back gears should be approximately 2 to 1.

This statement, you will recall, was disputed by each of the subsequent speakers, which would indicate that perhaps I was too hasty in giving voice to my thoughts. One or the other of us must be wrong. My lathe is either an improvement on the ordinary lathe or it is not, and it is to decide just such questions as this that these meetings are held. One member may think that that lathe is best which has the largest spindle, the longest bearings or the deepest bed, while another may be of the opinion that that lathe is best which enables him to machine the largest variety of work. If a lathe is to be operated in the hold of a ship, or in one's cellar, its usefulness is in direct proportion to the variety of work it is capable of handling, but where a lathe is to be used for manufacturing a staple article its usefulness is measured not by the variety but by the volume of work it is capable of handling.

In Cincinnati we are largely specialists, which enables us to put our work through in large lots. It is expedient, therefore, that each operation should be performed under the maximum speed the nature of the work will permit, as whatever percentage of time can be saved on one piece can be saved on the entire lot.

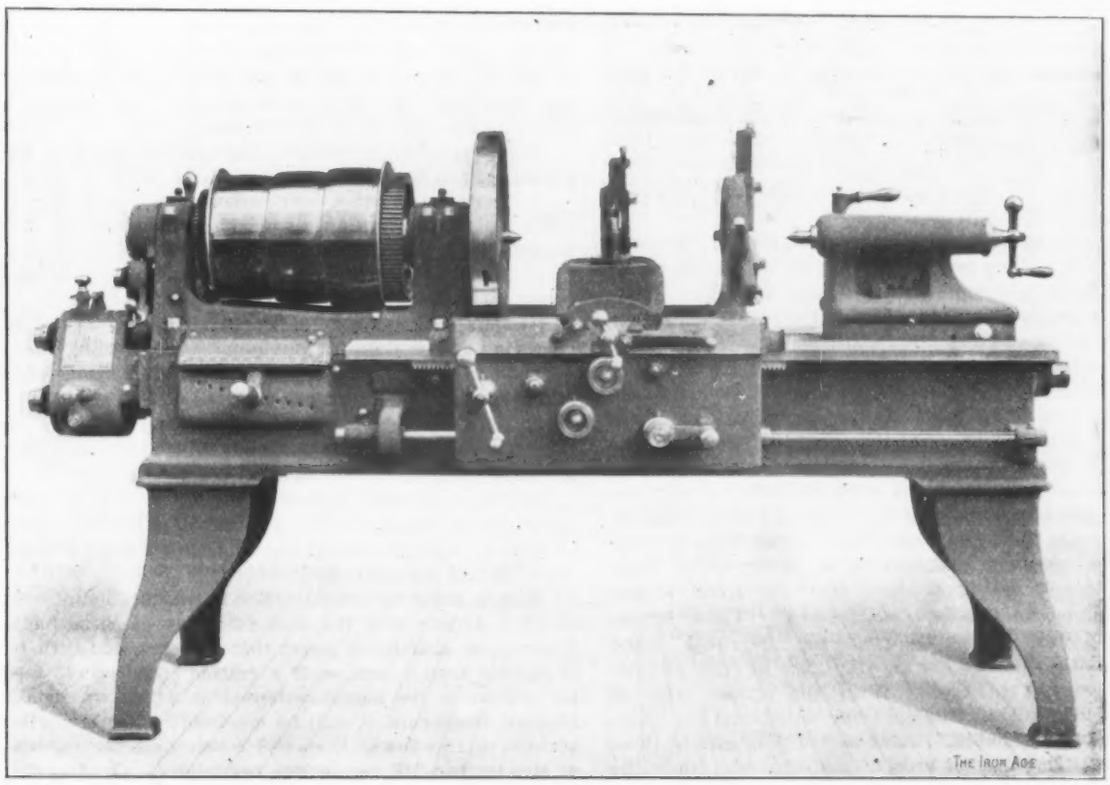


Fig. 1.—The New American High Speed Lathe, on Which the Tests Referred to in Mr. Norris' Paper Were Made.

THE INEFFICIENCY OF THE ORDINARY LATHE FOR HIGH SPEED CUTTING.

The first question I asked myself in taking up this subject was: What is it I want to learn? The answer was: How to remove with a Novo tool the greatest amount of metal in the most economical manner. If a shaft is to be reduced ¼ inch, should it be done in one cut or in two cuts? Should we use a fine feed or a coarse feed? Should we operate at a periphery speed of 150 feet or at 300 feet? The tool will stand so much and no more. What is this "so much?" Is it reached at a speed of 10 feet less than that at which the tool is ruined, or at a speed of 20 feet less? It is probable that the lasting qualities of a tool depend upon the amount of heat that is generated at its cutting edge. If this is true it is also probable that the life of the tool is shortened with every increase in either speed, feed or depth of cut. But which generates the more heat—a deep cut under a fine feed or a shallow cut under a coarse feed? If we can settle this point the question will resolve itself down to a matter of periphery speed. Of course the tools will vary, as will also the material upon which they operate; but by making all the tests upon shafts cut from the same bar, and repeating each three times with different tools, we should be able to obtain a line on at least one of the laws that govern high speed cutting. This, then, is obviously our starting point, and inasmuch as the average run of our work will not permit our taking a cut in which the cross section of the chip is greater than ⅛ x 3-64 inch our tests had best be confined to cuts of 1-16, 3-32 and ⅛ inch in depth by 1-64, 1-32 and 3-64 inch in thickness. The question, therefore, is to find the maximum speed at which the tool will operate under each of these cuts. How can this be determined? If we had a sufficiently powerful variable speed countershaft the speed could be increased as the cut advanced; but how would we know at what speed we were running at the moment the tool gave way. We know that on some work a Novo tool will stand a speed of 180 feet, so we

* Read before the Cincinnati Metal Trades Association, Cincinnati, Ohio.

might run a minute at 190, another minute at 200, and another at 210, &c., but the cuts would hardly be of sufficient duration to prove much. Then, too, having 27 tools to ruin, it would consume too much time. But what is the objection to operating on a conical shaft? The tools will probably be destroyed at a speed between 200 and 400 feet. This means that the large end of the shaft would have to be twice the diameter of the small end. If the length is kept within 24 inches we can use a taper attachment. I will try it.

Having finished my theorizing, we had made from the same bar of 0.16 carbon steel six taper shafts. Upon five of those shafts we operated dry, with the result shown in Table 1. It will be noted that the maximum speed of

Table 1.—Cutting Speed in Feet Per Minute at Moment Tool Was Destroyed.

	Feeds.			
	1.	2.	3.	4.
Cut.	1/64	1/32	3/64	Average.
1/16	326	320	381	342.3
1/16	425	360	327	370.6
1/16	339	354	330	341
1 average	363.3	344.6	346	351.3
3/32	326	230	262	272.6
3/32	368	268	209	281.6
3/32	332	285	227	281.3
2 average	342	261	232.6	278.5
1/8	336	259	231	275.3
1/8	326	260	220	268.6
1/8	310	267	240	272.3
3 average	324	262	230.3	272.1

425 feet was obtained when taking a 1-16-inch cut under a feed of 1-64 inch per revolution, and the minimum of 209 feet when taking a 3-32-inch cut under a speed of 3-64 inch per revolution. The first is probably higher than normal and the second lower—although not to the same extent as the first; but they are both valuable figures to have, inasmuch as they show the danger of drawing conclusions from single tests. If we reject this test of 425 feet, the first column of table would indicate that the periphery speed was independent of the depth of the cut, while the second and third columns indicate that the speed should be decreased as the depth of cut is increased. So also with the feeds. Line No. 1 appears to indicate that the speed is independent of the rate of feed, while lines 2 and 3 indicate that the speed should be decreased as the feed is increased. These figures were obtained by multiplying the indicated speed of the lathe spindle during the cut by the circumference in feet of the shaft at the outside edge of the shoulder made by the tool being tested, and are therefore absolutely reliable. If now we multiply each of these figures by the sectional area of the chips we obtain the number of cubic inches of metal that were being removed per minute at the moment the tool gave out. These products vary from approximately 4¼ to 16¼ cubic inches per minute, as shown in Table 2, and are all in favor of deep cuts and coarse feeds, which disposes of our original question very effectually.

Table 2.—Cubic Inches of Metal Being Removed Per Minute at Moment Tool Was Destroyed.

	Feeds.			
	1.	2.	3.	4.
Cut.	1/64	1/32	3/64	Average.
1/16	3.822	7.502	13.40	8.241
1/16	4.982	8.440	11.50	8.307
1/16	3.974	8.299	11.60	7.957
1 average	4.259	8.080	12.166	8.168
3/32	5.732	8.089	13.821	9.214
3/32	6.471	9.425	11.025	8.973
3/32	5.838	10.023	11.975	9.278
2 average	6.013	9.179	12.273	9.155
1/8	7.8785	12.144	16.274	12.0898
1/8	7.643	12.192	15.474	11.769
1/8	7.268	12.52	16.88	12.222
3 average	7.597	12.285	16.203	12.0269

We next took six cuts under water to determine how much faster we could operate than when turning dry. These cuts were ⅛ inch deep by 1-32 inch wide, and gave the results shown in Table 3, the average of which is less

Table 3.—Cut ⅛ Inch Deep by 1/32 Inch Wide, Running Wet.

272, 275, 305, 301, 258, 315

than 9 per cent. higher than the average speed attained under the same conditions working dry. And I am not at all sorry the gain is so slight, for had it been found that water added much to the efficiency of the tool we would all want to use it, notwithstanding the annoyance and expense we would be put to to provide suitable means for carrying off the water; but as it is we will be satisfied with the lower speed.

Table 4.—Cut ⅛ Inch Deep by 1/32 Inch Wide, Running Dry.

Speed.	Diameter.	Condition of tool.	Remarks.
149½	3½	Ruined in 11 inches	Scale.
151	3½	Ruined in 12 inches	Scale.
173	3¼	Uninjured in 26¾ inches	.....
199	3	Uninjured in 26¾ inches	.....
208	2¾	Ruined in 4½ inches	.....
208	2¾	Ruined in 8 inches	.....

Our next experiments, Table 4, were made dry on a straight shaft with a view to testing the durability of the tools under a constant speed. These cuts were all ⅛ inch deep by 1-32 inch wide, and developed the fact that it is necessary to operate at a much lower speed when removing scale. They show also that satisfactory results can be obtained at a speed within 9 feet of that at which the tool is ruined, which answers another of our questions, and illustrated the advantage of small increases between successive spindle speeds.

Other conclusions reached during this series of experiments can be summarized as follows:

1. That a tail stock center made of Novo steel is much longer lived than the centers furnished by the manufacturers.

2. That after a tool has been burned its end should be cut off at least a 16th inside the burnt portion.

3. That white chips do not indicate that a tool is operating at less than its maximum speed.

4. That each successive cut on a shaft permits of a higher cutting speed than the previous one.

5. That while water may be beneficial as a check on the expansion of work its other advantages are too slight to warrant our using it in general practice.

6. That until such time as means are devised for compensating for the expansion of the work it is inexpedient to operate on the average grade of steel at a speed greater than 175 feet per minute.

Next in order for consideration is the question of how to avail ourselves of the high efficiency of these tools. None of our shafting is larger than 4 inches, and little of it smaller than 1 inch, so if a cutting speed of 175 feet per minute is the maximum speed at which we should attempt to operate, it will be unnecessary for the lathe spindle to run faster than 668 revolutions per minute, or slower than 167 revolutions per minute. Grading the speeds between these limits gives us the series shown in column 1, Table 5, which enables us to turn the diameters

Table 5.—Relative Results Obtained on the New Lathe and a Standard 18-Inch Lathe.

1.	2.	3.	4.	5.
New lathe.			Standard lathe.	
Revolutions per minute.	Cutting speed.	Diameter.	Cutting speed.	Revolutions per minute.
668	175	1	175	668
589	174	1⅛	109	371
520	170	1¼	121	371
458	165	1⅜	134	371
404	159	1½	146	371
404	172	1⅝	158	371
356	163	1¾	170	371
356	175	1⅞	110	223
314	164	2	117	223
314	175	2⅛	124	223
276	164	2¼	131	223
276	172	2⅜	139	223
243	159	2½	146	223
243	167	2⅝	153	223
243	175	2¾	161	223
214	161	2⅞	168	223
214	168	3	175	223
214	175	3⅛	110	134
190	162	3¼	114	134
190	168	3⅜	118	134
190	174	3½	123	134
167	160	3⅝	127	134
167	165	3¾	132	134
167	170	3⅞	136	134

167	175	4	140	134
...	...	5	175	134
...	...	9	175	74
...	...	12⅜	175	54
...	...	22¼	175	30
...	...	37	175	18
...	...	60¾	175	11
...	...	111	175	6

given in column 3 at the cutting speeds shown in column 2, none of which are as much as 10 per cent. lower than the desired speed of 175 feet. These 12 speeds are obtained by means of a three-step cone, the diameters of which are given in Fig. 2, a back gear made in the ratio of 2.13 to 1, and a two-speed friction countershaft.

In order to compare the efficiency of a lathe made in this way with one of standard design, I give in Fig. 3 the dimensions of the cone and the ratio of the back

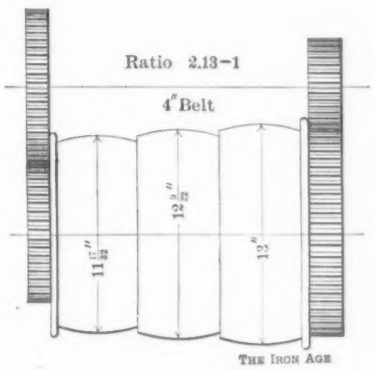


Fig. 2.—Cone Pulley of Special Lathe.

gears of an 18-inch lathe, said to be the latest product of one of the best-known concerns in the country. The speeds on this machine are shown in column 5, Table 5, and, to my mind, require only a glance to convince one of their unsuitableness for high speed cutting. They are as unfit to produce economical results as a blind man is to read a micrometer or to scrape in the platen of a milling machine, and how any one can claim that they are all right is beyond my understanding. It has been shown that the maximum speed need be but four times faster than the minimum speed, while on this machine the maximum speed is more than 111 times the minimum speed. If, therefore, the lathe is speeded so that its maximum speed

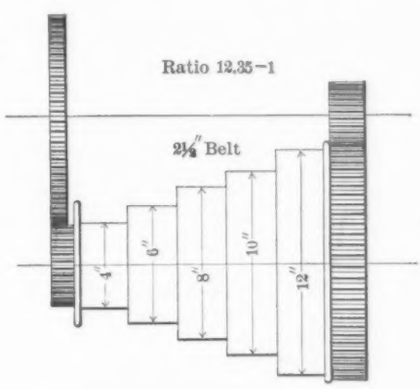


Fig. 3.—Cone Pulley of Standard Lathe.

will cut a 1-inch shaft at the rate of 175 feet per minute, it will obviously require a diameter of 111 inches to maintain the same cutting speed when running at the minimum speed—which is rather a large piece to swing in an 18-inch lathe. And what is true of the slowest is true of the six of the others. We see, for instance, that there are but three speeds adapted to work between 1 and 4 inches in diameter, that a 3⅛-inch shaft has to be turned at the same speed as a 4-inch, a 1⅞-inch at the same speed as a 3-inch, and a 1⅛-inch at the same speed as a 1¾-inch. Now let us see what this means to us in the course of a year if both lathes were kept employed on 1⅛-inch work. Allowing 55 hours to the week, and 50 weeks to the year, makes a run of 2750 hours. Taking wages at 20 cents per hour and general expense at 25 cents per hour, makes the output of each lathe cost $0.45 × 2750, or $1237.50. Assuming the selling price of this work at one and one-quarter times what it cost to produce on an ordinary lathe, gives us a return of 1¼ × 1237.50, or $1546.88, which we will call the market price of 109 finished shafts. This brings us to the following proposition: If a lathe operating at a cutting speed of 109 feet per minute turns out 109 shafts per year, how many shafts per year can be turned out on a lathe operating at a cutting speed of 174 feet per minute? If we disregard the time consumed in handling the work, the answer is 174 shafts, or 59.6 per cent. more than can be turned out at the lower speed, in which event we would receive for the year's output 1.6 × 1546.88, or $2475. The cost, however, remains as before, but instead of profits being but $1546.88 — $1237.50, $309.38, they are $2475 — $1237.50, $1237.50, or more than four times as large.

This, however, is an extreme case, as the average cutting speed on our special lathe is but 22 per cent. more efficient than the average cutting speed on the standard lathe, so at such times as the lathes are employed on a variety of diameters it is not likely that the profits on the product of the special lathe would be more than twice those earned on the product of the standard machine. But all of this is based on the assumption that the standard lathe has sufficient power to remove a chip of the same sectional area as the special lathe. We were told at the last meeting that the belt on a 36-inch lathe driven by a 45-inch pulley slipped under a cut of 1-16 x 1-32 inch, which would indicate that the ordinary 18-inch lathe will not begin to stand the cuts we can take on our special lathe. Why is this? How do we obtain so much more power? If we ask the builder if a certain lathe is powerful enough to perform certain work, he will answer: "Yes, it is geared in the ratio of 12 to 1," or he will say: "It's the highest geared machine on the market, which gives it power to burn." What, then, can we expect from a lathe geared in the ratio of 2 to 1? Let us see.

The maximum speed of both lathes is the same, each runs at 668 revolutions per minute. A 4-inch pulley running at this speed gives a belt travel of 699.53 feet per minute, which, multiplied by the width of the belt, gives a surface speed of 145.71 square feet per minute, as against a surface speed of 672.23 obtained from a 4-inch belt running on an 11 17-32-inch pulley. The surface speed to the one is to the surface speed of the other as 4.61 is to 1, so if both lathes are driven by belts of equal thickness the available power of the special lathe will be 4.61 times that of the ordinary lathe. It is a well-known fact, however, that a heavy double belt will not operate to advantage on a 4-inch pulley. It is also a fact that a double belt will transmit ten-sevenths the power of a single belt, which increases the power of a special lathe to 6.59 times that of the ordinary lathe. Then, too, there is the gain due to the additional arc of contact. In the ordinary lathe this arc is approximately 133 degrees, while in the special the arc is approximately 179 degrees, which increases our power to 8.87 times that of the ordinary lathe. "But how about the ratio of the back gears?" asks the lathe builder. The back gears? What have they to do with it? Is there any combination of gears in the world that will enable a machine to perform more work than the belt supplies power for? Here, then, is where the lathe builder falls down. He knows that the greater the ratio the greater the cut, but entirely overlooks the fact that where power is obtained at a forfeiture of speed the greater the ratio the greater the curtailment of profits.

The tests referred to in this paper were made on the new high speed lathe built by the American Tool Works Company under the direction of Mr. Norris. The general appearance of the machine is shown in Fig. 1. The machine is particularly adapted to operate on work ranging from 1 inch to 4 inches in diameter. It is designed throughout to meet the special requirements of modern high speed tool steels. It has been the aim to place the limit of work at the tool rather than at the belt, and with

this in view it has been given enormous belt power. It is claimed that the contact of the belt on the smallest step of the cone is greater than on the ordinary 36-inch lathe. The rapid feed changing mechanism is positive and capable of feeding up to the limit of belt power.

A Forty Million Dollar Government Surplus.

Heavy Importations Swell the Treasury Receipts.

WASHINGTON, D. C., June 9, 1903.—In spite of legislation enacted by Congress during the past 18 months for the purpose of bringing the revenues down approximately to the level of expenditures, the Treasury balance on the 30th inst., the end of the current fiscal year, now promises to exceed $40,000,000, or at least $20,000,000 in excess of the estimates of Congressional experts when the Spanish war revenue act was finally repealed. This large addition to the surplus funds in the Treasury is due almost entirely to the phenomenal increase in customs receipts, which have supplied over $30,000,000 of the balance for the year up to the present date.

The unexampled prosperity of the country is fully reflected in the balance sheet of the Treasury for the 11 months up to June 1 of this year. While the expenditures have increased from $437,371,797 to $471,586,852, as compared with last year, yet the receipts for the current year lack but $3,000,000 of equaling those of the corresponding period a year ago, notwithstanding the reduction of $40,000,000 caused by the repeal of the war revenue act, the total on June 1 being $510,533,471, as against $513,727,719 a year ago. The surplus on June 1, therefore, is found to be $38,946,619, and as the current receipts are now considerably in excess of expenditures, the favorable balance will easily pass the $40,000,000 mark by June 30.

The enormous importations of the past 11 months, which have consisted so largely of iron and steel and of manufacturers' materials in a sufficiently advanced condition to pay the average rate of duty, have swelled the customs receipts in a wholly unexpected manner. The Treasury experts did not anticipate that the influx of foreign goods would continue throughout the year at the rate current when Congress convened last December, and it was therefore thought that the revenue from this source would probably not surpass the receipts of last year by more than $5,000,000 or $6,000,000. It appears, however, that for the 11 months of this year the total receipts from customs have amounted to $262,194,416, as compared with $233,187,343 a year ago, or an increase of $29,005,073. No great gain over last year is expected during the current month, but it is probable that by the end of the year the increase from customs will amount to a round $30,000,000. Within the past few weeks the customs receipts have shown wide fluctuations, amounting on the 1st inst., for example, to $719,616, as compared with $337,629 on the same day a year ago, but the average daily receipts have been but slightly above the corresponding figures of 1902.

Some advance figures prepared by the Bureau of Statistics show in an interesting manner the extent to which the abnormally large importations of iron and steel have contributed to the surplus which has accumulated in the past 11 months. While the final figures for the month of May have not yet been received, the imports of all forms of iron and steel for the 11 months ending May 30 are estimated at $48,000,000 in round figures, as compared with $23,351,562 for the corresponding period of 1902, showing an increase for the current year of nearly $25,000,000, or more than 100 per cent. Estimating the duties on this increase at 45 per cent., about the average rate of the metal schedule, it is seen that from this source alone no less than $11,250,000 of the surplus has been derived.

Internal Revenue Receipts Decreased.

The effect of the repeal of the war revenue act is clearly shown in the receipts from internal revenue. For the 11 months ending May 30, 1902, the total revenue from this source amounted to $248,753,784, while for the current year the aggregate is but $209,436,850, or a decrease of $39,316,934. The internal revenue receipts are therefore falling off at the rate of about $3,500,000 per month, which will show a loss for the year of about $42,000,000, which is not far from the estimate of the Senate Finance Committee, made at the time the war revenue act was repealed.

While the figures are less imposing, nevertheless the miscellaneous receipts are regarded by Treasury experts as a very reliable barometer of the country's prosperity, and a most satisfactory exhibit in this regard is made by the balance sheet for the past 11 months. These receipts for the current fiscal year to June 1 amounted to $38,902,204, as compared with $31,784,591 for the same period a year ago, or a gain of $7,117,613, or nearly 25 per cent. These receipts indicate not only a healthy condition of affairs throughout the country, but especially in the miscellaneous transactions of the people with the various branches of the Treasury Department, from which these receipts are largely derived.

A glance at the expenditures for the last two fiscal years shows that they also reflect the general welfare of the country. The largest increase is shown in the civil and miscellaneous disbursements, which have risen from $104,734,989 a year ago to $117,523,730. The cost of maintaining the army shows only a small increase, from $104,441,414 to $110,136,789. The relatively large increase in expenditures on account of the navy from $61,952,868 to $74,861,233 is due to the cost of battle ships, upon which work has progressed very rapidly during the past 11 months. This amount has been disbursed to manufacturing concerns and has speedily found its way into the pockets of the people. The disbursements on account of the Indians have been very small and the cost of pensions has been almost stationary, at about $128,000,000. The interest account shows a small falling off.

Outlook for Revenue Legislation.

The leading members of the Finance and Ways and Means committees have been observing these figures during the past month or two with a great deal of interest and plans are on foot for the further reduction of the revenues by legislation to be enacted next winter. It is not proposed to disturb any feature of the tariff, but it seems probable that steps will be taken that will result in a small reduction in the receipts from distilled spirits and in an increase in the amounts paid to importers of raw materials in the form of drawbacks. A proposition which is receiving favorable attention from both Senate and House leaders involves the reduction of the tax on distilled spirits from $1.10 to 70 cents per gallon, which would probably result in a very great increase in the amount of grain alcohol used for manufacturing purposes, though there would probably be no great advance in the consumption of spirits as a beverage, as the difference in tax would be too small to affect the price of the retailed product. Coupled with this decrease in the spirit tax it is proposed to supply methylated grain alcohol, which is nonpotable, free of tax for use in the manufacturing industries of the country.

The estimated increase in the total amount of drawbacks paid to importers referred to will come, it is believed, from the passage by Congress of the Lovering bill, or a similar measure, liberalizing the drawback laws. The present attitude of the Treasury Department with reference to drawbacks is highly satisfactory to manufacturers and exporters, and the influence of the Secretary of the Treasury is counted upon to assist in securing legislation to obviate technical difficulties which cannot be fully met by departmental regulation.

W. L. C.

Orders for engines were booked this week by the Harrisburg Foundry & Machine Company of Harrisburg, Pa., from the town of Hudson, Mass., 500 horse-power; Pittsburgh Coal Company, 250 horse-power; Jarvis Terminal Storage Company, 125 and 175 horse-power; Heat & Power Company, Biloxi, Miss., 300 horse-power, and Capital Light, Heat & Power Company, Jackson, Miss., 150 and 300 horse-power.

Amended Drawback Regulations.

Treasury Department Issues an Important Circular.

WASHINGTON, D. C., June 9, 1903.—Following the important decision with regard to the amendment of the general drawback regulations rendered by Assistant Secretary Armstrong, and described in *The Iron Age* of last week, instructions have been forwarded to the Collector of Customs at New York with regard to the liquidation of all entries heretofore suspended for the reason that formal applications for the fixing of a rate of allowance had not previously been filed with the Department and a circular has been prepared setting forth the text of Article 1196 of the Customs Regulations of 1899 in its amended form.

The suspended entries were largely those of manufacturers in the iron and steel trade, including producers of wire and wire rope, manufacturers of steel drills and other similar tools, builders of railroad cars, &c. In all these cases it appeared that the goods exported were ordered on short notice and that the insistence upon a strict compliance with the letter of the regulations would not only prevent manufacturers in the future from availing themselves of cabled orders to be shipped with benefit of drawback, but would also result in heavy loss to the exporters who, relying upon the time honored practice at New York, had filed their entries in advance of formal applications. The Department therefore addressed a communication to the collector at New York in part as follows:

"The drawback regulations contemplate both the establishment of a rate and an entry for drawback prior to exportation of the manufactured articles. Drawback has, however, been allowed on shipments pending the determination of the rate in cases where a timely entry was filed and the exportation was established by the papers, but it was not deemed advisable to depart from the regulations to the extent of dispensing with an application as a condition precedent to the allowance of drawback. The application informed the Department of the intention of the manufacturer, and made possible a preliminary inquiry without delaying the manufacture.

"The matter has been fully considered by the Department and it is seen that a hardship would be involved in the disallowance of drawback in cases where exportations were made on the strength of the practice at your port as above set forth. It is also seen that cases may arise where the demand for particular goods might preclude the making of a timely application; such a case is where manufactured articles are ordered by cable for immediate shipment.

"In view of all the facts developed, I am of the opinion that Article 1196 of the Customs Regulations of 1899 should be amended for the allowance of drawback on manufactured articles exported before the filing of an application or the establishment of a rate, provided that the regulations requiring a timely entry, inspection, supervision of lading, &c., be complied with. A circular to this end will be issued.

"You are hereby authorized to liquidate all unliquidated entries of exportations heretofore made before the filing of an application for the establishment of a rate, provided that the regulations were otherwise fully complied with."

The Modified Regulations.

In accordance with the above letter, Assistant Secretary Armstrong has issued the following circular embodying the amendments to Article 1196 of the Drawback Regulations, the changes being indicated in italics.

"To Officers of the Customs and Others Concerned:

"Article 1196 of the Customs Regulations of 1899 is hereby amended to read as follows:

"No drawback shall be *paid* on any articles of domestic manufacture exported until the rate of allowance has been established.

"Application for the establishment of a rate shall be made to the Secretary of the Treasury. Such application shall contain a detailed statement, verified by oath or affirmation, showing the kinds of articles intended for exportation, the kinds and quantities of imported materials used in the production of each particular article, the rate of duty paid on such material, and such other data as will enable the Department to determine, first, whether or not the foreign materials so appear in the article to be exported that the quantity of each such material can be readily ascertained ; and, second, the rate of drawback thereon.

"*Where manufactured articles shall have been exported after compliance with all the requirements of timely entry, inspection, supervision of lading, &c., the Department will consider a request to waive the requirement of application.*"

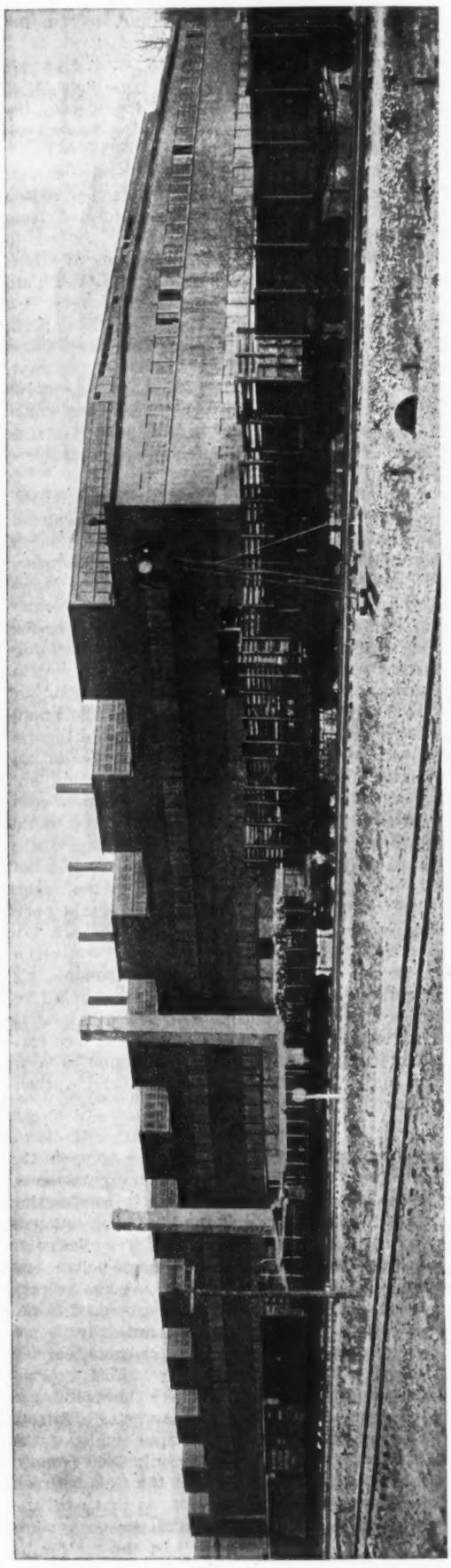
The Department having ordered all suspended entries to be liquidated, an important question has now arisen as to whether entries which have been rejected from time to time within recent years because of failure to file formal applications for the fixing of a rate of allowance are entitled to be reconsidered and drawback paid thereon. Careful investigation shows that very few such entries have been rejected at the port of New York, and only a comparatively small number at Boston and Philadelphia. At the smaller ports, however, the regulations have uniformly been held to preclude the allowance of drawback where the entry has been filed before the formal application and the aggregate duties thus withheld from exporters are estimated at several hundred thousand dollars.

It is beyond question that only such rejected entries as have been filed since July 13, 1898, can be reconsidered, that being the date upon which the Attorney-General authorized the Department to accept manufacturers' records in lieu of a physical examination for the purpose of identifying the raw material in the finished product as being of foreign origin. As it is obviously impossible at this time to identify the material in goods heretofore exported, the Department cannot reconsider any entries rejected prior to the Attorney-General's decision, nor can any such entries be reconsidered unless the manufacturers have preserved complete records showing the importation of the materials, the percentage thereof employed in the manufacture, the dates of shipment and destination of the goods, &c. While this important question has not been finally decided, the disposition of the Department is to reconsider the rejected entries, chiefly for the reason that it is highly undesirable from an administrative standpoint, as well as unjust to the export interest, that shippers making entries at certain ports should have enjoyed the benefits of the drawback law denied to others. It is probable that an investigation will be made to ascertain as nearly as possible the amount of refunds involved in the liquidation of all rejected entries for which adequate proofs can now be presented. If the amount is no larger than is now estimated, and if manufacturers' records are found to be in satisfactory shape, it is likely that all properly authenticated entries will be liquidated. W. L. C.

The substitution of electricity for steam upon the elevated railways of New York has proved a great success, not only in the direction of economy but in accelerating the speed, which on a railway of the kind in question is a matter of the greatest importance. The *Scientific American* asserts that the electrical horse-power employed amounts to 45,000, which is far above the average steam power in use formerly. The average speed is not only increased, but more cars can be hauled by 25 per cent. and the average number of passengers carried daily is 800,000. The greatest tractive effort exerted upon a train is now 20,000 pounds, where the motors are distributed throughout the train, each car being available for adhesion; but when locomotives were employed the utmost traction on the draw bar was only 7000 pounds. The service has been so improved that the time between terminals has been reduced 25 per cent., so that with the same headway it is possible to run 25 per cent. more trains than with the steam service. In the matter of cleaner service, absence of noise, abolishment of dripping oil and hot water, there is no comparison between the steam and the electric systems.

The Aiken Improved Roof Construction for Manufacturing Plants.

Until quite recently skylights and ventilators in the roof have been the only means of obtaining light and ventilation in manufacturing buildings of great width. Obtaining sufficient light in wide buildings by the use of skylights adds materially to the cost of the roofs, and in many cases this cost is prohibitive, forcing the use of a series of buildings of moderate width, with spaces between the buildings for light and ventilation. Such construction occupies much more space than where an industry can be placed under a single roof.



NATIONAL MALLEABLE CASTING COMPANY'S PLANT.

A new form of construction, designed and patented by Henry Aiken of Pittsburgh, is intended to permit the erection of buildings of great width and of such form that all parts shall have ample light and thorough ventilation, thus permitting the grouping of all departments of a manufacturing plant under one roof.

This construction consists of a series of trusses, 8, Fig. 2, parallel with each other, and alternate roof surfaces, 3 and 4, at different levels extending between the trusses, thus affording intermediate spaces between the elevated sections of the roof for light and ventilation. The upper roof surface is supported on the top chords of the trusses and the lower roof by the bottom chords. The windows, 8, for the admission of light and ventilation, are placed in the sides of the parallel trusses, and admit both light and air in the most efficient manner, the light being diffused throughout the building evenly and without dark shadows. This will be understood from the sketch, Fig. 3, in which the dotted lines show the entering rays of light and their complete diffusion. The roof is almost flat, having a slight pitch of 2 feet to the hundred. The roof sheathing is supported on either wood or steel purlins and is covered with 2 inches of spruce plank, tongued and grooved, the whole being covered with four-ply felt and gravel roofing, thus making a weather proof, sweat proof and semi fire proof structure.

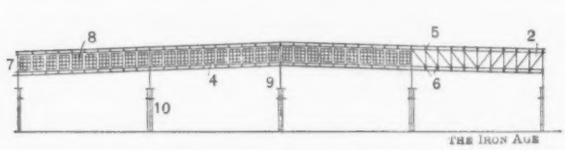


Fig. 2.—Cross Section.

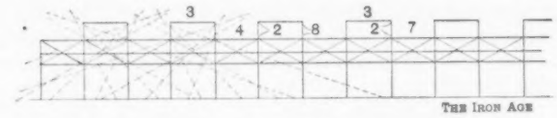


Fig. 3.—Diagrammatic View Showing Light Distribution.

This construction of roof permits the lower portions to be used as a walk for the window cleaner. From the lower to the upper roof the distance is about 9 feet, which permits the use of a continuous line of sash on each side of the raised sections for a distance equal to the entire width of the building. The depth of the sash is about 7 feet. Each upper section of roof is provided with a bridge which forms a continuous passageway the whole length of the building. Buildings constructed in this manner can be added to at any time, in width or length, as light and ventilation are not dependent on either side or end lights or on the width of the building.

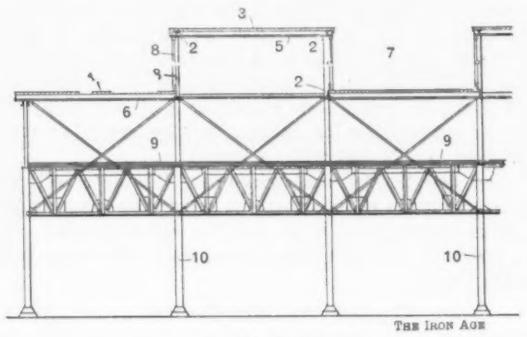


Fig. 4.—Section.

The accompanying half-tones illustrate the advantages of this method of construction, the plant being that of

the National Malleable Casting Company at Sharon, Pa. The general view, Fig. 1, is of a building divided into three aisles, each 75 feet wide by 750 feet long. The product of this plant is steel castings exclusively. The open hearth furnaces are located in one side aisle, the molding and casting are done in the middle aisle, and the core making, shipping and cleaning departments are in the third aisle. The finishing department is in a 100 x 200 foot wing. The interior views, Figs. 5 and 6, show the even illumination of the interior.

This construction has also been adopted by the Standard Steel Car Company, Butler, Pa., for their three buildings, which consist of a power plant, a central or main building in which all the manufacturing departments are under one roof, and a car painting department, which is separated from the main building to avoid danger from fire. The main building for part of its length is five aisles wide and the remaining portion is three aisles wide. Each aisle is 80 feet wide, making the building at its greatest width 400 feet by 1612 feet long. This single roof covers an area of over 11 acres. The same design is used in buildings of the Sharon Steel Company's pipe plant.

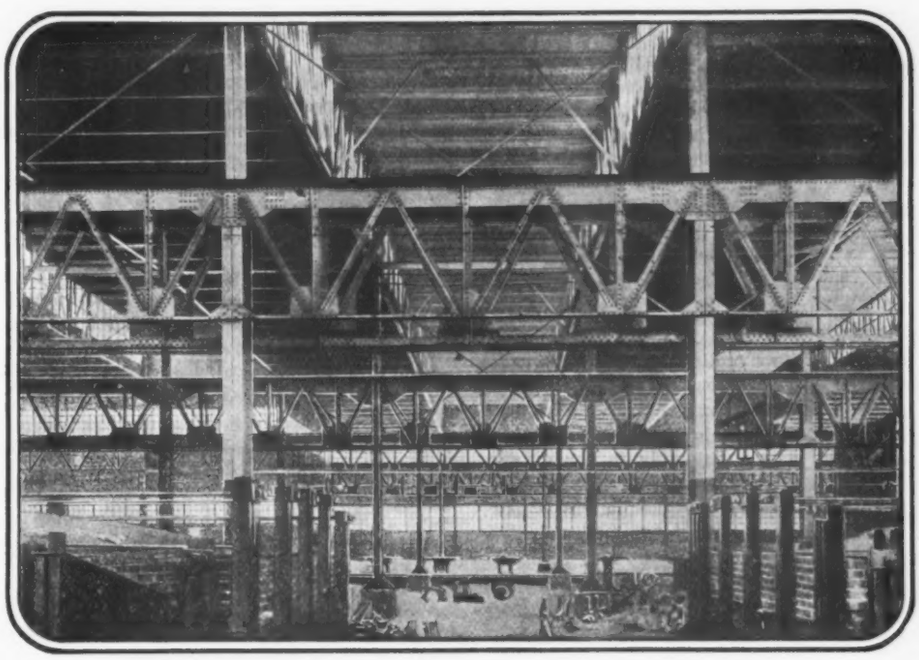


Fig. 5.—Transverse View of Annealing and Cleaning Department.

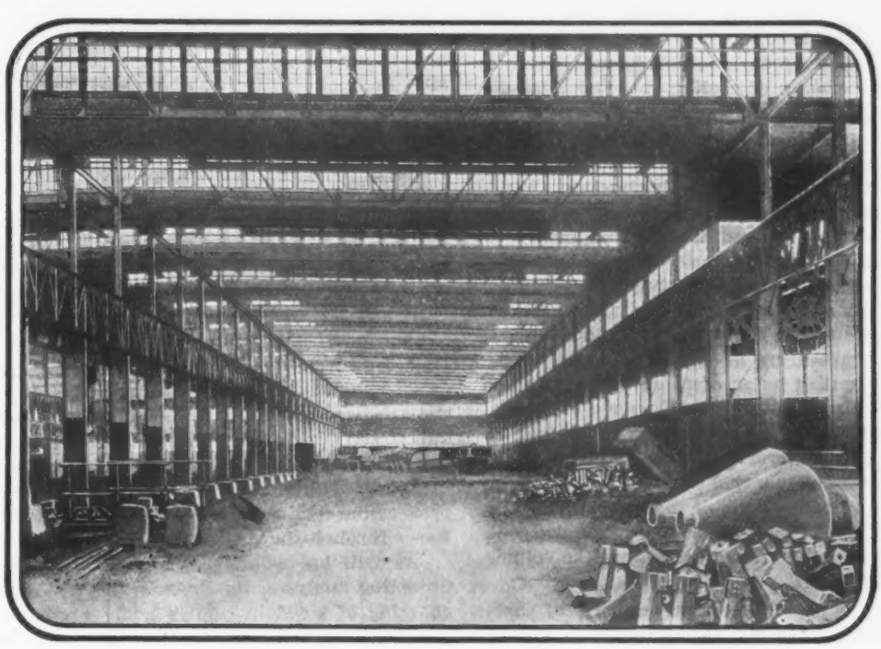


Fig. 6.—View of Side Aisle, 75 Feet Wide by 750 Feet Long.

NATIONAL MALLEABLE CASTING COMPANY'S PLANT.

According to the latest cable dispatches concerning the new Cunard ships the directors have at last placed orders for them. The size of them has been increased, the displacement being 35,000 tons and the horse-power in the usual proportion of two to one, or 70,000 horse-power. When these steamships materialize, as they doubtless will in due time, engineers will have something to study over and the daily press reporters an opportunity to evolve a great many conclusions from their inner consciousness which are contrary to practical experience.

It is stated that the sheet mill of the Reading Iron Company, Reading, Pa., has closed down for repairs.

A New Charcoal Cooling Process.

BY BERNHARD ZWILLINGER, NEW YORK.

It has been impossible thus far to supersede the kiln process of manufacturing charcoal by the retort system on account of the smaller capital required for installation, the lower cost of production and the low rate of wear and tear. This is true in spite of the fact that the retort system produces a greater yield of wood alcohol, acetate of lime, tar, &c.

The economic results obtained in the kiln process with recovery of by-products would be considerably greater if the time required for cooling the charcoal were shortened. Operative capacity is considerably hampered because the charcoal after the distillation has been completed cannot at once be removed from the kiln. According to quantity and to the season it is necessary to leave it in the kiln six to seven or even eight to nine days in order to allow it to cool off. It is evident, therefore, that since about 66 per cent. of the time during the working year is required to charge and to discharge, nearly 33 per cent. of the capital invested is unproductive.

The drawback of this slow cooling has led those who have been interested in the progress of the charcoal industry to various proposals and plans, purely mechanical in their character. These proposals look toward the introduction of machinery whose object is to convey the charcoal as soon as the process of distillation is completed into pits or basins and to charge the kiln afresh. Another proposal has been to employ cooling mediums like cold gases mixed with air, bringing them into intimate contact with the hot charcoal, so as to shorten the cooling period materially in this way. Thus far the efforts to remove the drawback in the manner indicated have been unsuccessful.

It has been practically impossible to remove the hot charcoal from the kiln by machinery and appliances, and the injection of cold gases as a cooling medium has not obtained a foothold in practice because they contain too much atmospheric oxygen, and because further, the physical characteristics of cooling charcoal were not taken into account. Besides, the machinery proposed was not suitable. The accuracy of this statement is shown by the fact that there is not a single plant of kilns operated with any other but the ordinary cooling method, which consists in allowing the charcoal to remain in the kiln until it has been sufficiently cooled by atmospheric air. In common with all porous substances charcoal has, notably when freshly burned, the property of absorbing a considerable quantity of gas. This property is a function first of the structure of the charcoal itself, and furthermore also of the temperature at which it has been produced. Therefore it may be greater or less. Since the charcoal produced in the kiln is usually made of several kinds of wood, and since the temperature in the kiln is subject to variations at different parts, and since, furthermore, charcoal possesses a varying capacity for the occlusion of various gases, it is impossible to determine exactly how large a quantity of gas is absorbed by the charcoal. On an average it amounts to nine to ten times the volume with larger sized charcoal.

In order to provide for this peculiar property of charcoal other important points must be considered in solving the problem of cooling it:

1. The cooling medium must not be expensive.

2. The cooling medium must be available in adequate quantities.

3. It must be possible to chill the cooling medium sufficiently in order to carry through the operation rapidly.

4. The cooling medium must not exert the slightest injurious effect upon the quality of the charcoal.

A cooling medium meeting all these requirements has been found in the gases which are produced during the distillation of wood under exclusion of air. These gases possess the composition shown in the accompanying table:

Time of distillation. Hours.	Carbonic acid.	Carbonic oxide.	Methane.	Ethylene.	Hydrogen.	Nitrogen.	Oxygen.
3	58.69	31.29	3.94	Trace	3.87	1.23	Trace
4	61.90	30.10	...	....	...	...	Trace
5	62.00	32.50	...	....	...	...	....
7	59.80	31.90	...	....	...	...	....
8	57.48	34.52	4.37	0.45	2.78	Trace	....
9	58.50	33.80	...	....	...	...	....
10	57.90	35.10	...	....	...	...	....
11	55.60	34.38	5.12	0.32	3.99	Trace	....
15	64.68	30.32	2.43	0.69	1.21	Trace	....
			II.				
17	56.94	36.22	2.47	Trace	3.94	Trace	....
19	60.80	30.40	...	....	...	...	....
20	61.22	....	...	....	...	...	....
21	59.20	31.10	...	....	...	...	....

At 15 degrees Celsius and 760 mm. pressure this composition by weight corresponds to the following composition by volume.

Carbonic acid	10.172
Carbonic oxide	5.595
Methane	0.699
Hydrogen	0.561
Water	0.005
Total	17.032 c. m. = 28 kg.

A cubic centimeter would contain the following on the basis of above analysis:

	Volume in liters.	Volume in per cent.	Weight of gases in 1 c. m., in kilograms.	Specific heat.
Carbonic acid	597	59.7	1.173	0.2538
Carbonic oxide	328.7	32.8	0.411	0.1027
Methane	41.5	4.5	0.029	0.0170
Hydrogen	32.3	3.2	0.028	0.0879
Water	0.5	0.05	....	....
	1,000		1.641	0.4614

0.4614 per cubic meter = 0.2811 per kilogram.

The water was purposely ignored in the calculation of the weights and of the specific heat of the gases because it is caught in the condensation apparatus, and therefore is of no account in the cooling process. Since the metric system has been made the basis of these computations we may note that 1 kg. is equal to 2.2 pounds, and 1 c. m. to 35.31 cubic feet. One heat unit is the quantity required to heat 1 kg. of water by 1 degree Celsius, and not 1 pound of water by 1 degree F.

F. Fischer obtained from 100 kg. of beech wood 28 kg. of gases, the average composition thereof being as follows:

	Kilograms.
Carbonic acid	20.00
Carbonic oxide	7.00
Methane	0.50
Hydrogen	0.05
Water	0.045
Total	28.00

The waste gases obtained by the method usual in the United States (*i.e.*, of drawing atmospheric air by means of an exhauster through a large series of openings into the kiln, and subsequently driving them, united with the vapor and gases, into the cooling apparatus) are not suitable for cooling purposes. Since they contain a pretty large percentage of free oxygen they would not only prevent the cooling of the charcoal, but would bring about losses through the combustion of the same.

As will be understood from an examination of the preceding analyses, the gases which are obtained by the charring of wood in retorts under exclusion of air are free from oxygen and therefore are entirely suitable so far as their chemical composition is concerned for the cooling medium sought after.

So far as their production is concerned it would be necessary to erect one or two retorts as an auxiliary to existing plants of kilns, the number of retorts depending upon the number of kilns which are to be cooled. These retorts might be regarded as gas producers. If it is a question only to produce gas in the retort externally fired and if no attention is paid to other products it is possible to obtain through proper working about 15,000 cubic feet of gas per cord of wood. When, however, the production of charcoal, wood alcohol, acetic acid, &c., is the main object it is possible to obtain only about 10,000 cubic feet of gas per cord. If the charcoal in the kiln ab-

sorbs ten times its volume of wood gases it would require 19,200 cubic feet (543.9 c. m.) of gas in order to saturate the 1920 cubic feet (54.39 c. m.) of charcoal.

It is possible, therefore, to consider the cooling process as consisting of two separate periods; one during which the coal is saturated with gases and during which no reduction in the temperature takes place, and the second in which the cold gases effect the cooling of the charcoal. As a matter of fact, however, the process of absorption and of cooling may take place simultaneously or successively, this being very difficult to determine experimentally. Theoretically the process has been divided into two parts in order to simplify the calculation.

Assuming that the quality of charcoal obtained from 30 cords of wood is equal to 30,000 pounds, or 13,636 kg., and that after the completion of the distillation it has a temperature of 350 degrees Celsius, then the question is, how many hours will be necessary in order to cool down the charcoal to the normal temperature of 15 degrees Celsius if 500 cubic feet (14.1 c. m.) of gas are forced into the charcoal per minute.

There were required for the saturation of the coal 19,200 cubic feet of gas, which were compressed to one-third of their former volume in the pores and small channels of the charcoal, but, as is well known, heat is freed during the compression of gases, therefore the temperature in the kiln will rise to an extent equivalent to the work performed. There are in the 19,200 cubic feet of gas (543.9 c. m., which correspond to a weight of 853.9 kg. at 15 degrees Celsius after having left the condenser, whose mean specific heat at equal pressure is 0.3144) 4027 heat units obtained by the following: $853.9 \times 15 \times 0.3144$. By the compression of the gases to one-third of their original volume work is performed which is transformed into heat. One kg. of gas is compressed from 0.714 c. m. to 0.238 c. m. at 15 degrees. This would give $\frac{273}{3} = 91$ C. $\times 2 = 182$ C. Therefore, this would be per kilogram $182 \times 0.3144 = 57.22$ heat units, or for 853.9 kg. $853.9 \times 57.22 = 48{,}860$ heat units. The temperature therefore would be increased in the kiln by $4027 + 48{,}860 = 52{,}887$ heat units after the saturation of the charcoal. The charcoal itself has 1,150,112 heat units, arrived at in the following manner: $13{,}636 \times 350 \times 0.241$, and after saturation with the gases $1{,}150{,}112 + 52{,}887 = 1{,}202{,}999$ heat units.

If the kiln were to be opened for the sake of discharging it at the time when the temperature of the charcoal had fallen to 15 degrees Celsius then the coal would contain $13{,}636 \times 15 \times 0.322 = 65{,}861$ heat units. Therefore it would be necessary to eliminate by the cooling process $1{,}202{,}999 - 65{,}861 = 1{,}137{,}138$ heat units.

But the charcoal is not alone cooled by introducing into it cold gases, but also by the interchange through the masonry of heat between the interior of the kiln and the outer atmospheric air.

Let us examine the procedure of the cooling operation by the cold gases. If 500 feet of gas at a temperature of 15 degrees Celsius is passed through the charcoal per minute, which is equal to 14.1 c m., the weight thereof per cubic meter in an unpurified condition will be as follows:

Contents of 1000 Liters of Unpurified Gas.

Gases per liter.	Weight per liter. Grams.	Weight of gases in 1 c. m. Grams.
556 carbonic acid	1.966	1,093.00
343 carbonic oxide	1.251	429.09
58 methane	0.715	41.4
3.1 ethylene	1.251	3.8
39.9 hydrogen	0.0891	3.5
1,000		1,569.79

The total weight of the gases therefore is as follows: 500 cubic feet = 14.1 c. m. $\times$ 1570 = 22,137 kg. per minute. The specific heat of these gases is as follows per cubic meter at equal pressure:

Per cent. of volume per cubic meter.	Specific heat.	Specific heat per volume. Per cent. per cubic meter.
55.6 carbonic acid	0.2164	0.2365
34.3 carbonic oxide	0.2476	0.1062
5.8 methane	0.592	0.0245
0.31 ethylene	0.4040	0.0015
3.99 hydrogen	3.1406	0.1253
100		0.4940

or 0.3144 per kilogram. Therefore, 14.1 c. m. of gases contain 22.13 kg. $\times$ 15 $\times$ 0.3144 = 104.3 heat units. If two equal masses, say 22.13 kg. of gas at 15 degrees Celsius and 0.3144 specific heat units are brought into contact with 22.13 kg. of charcoal at a temperature of 350 degrees Celsius and 0.241 specific heat, so as to produce the same temperature with both, then the temperature upon equalization is as follows:

$$t = \frac{22.13 \times 350 \times 0.241 + 22.13 \times 15 \times 0.3144}{22.13 \times 0.241 + 22.13 \times 0.3144} = \frac{1971}{12.28} = 160$$

degrees C.

Before they came into contact with the charcoal 22.13 kg. of gases at 15 degrees Celsius carried 104.3 heat units. After leaving the kiln and being heated to 160 degrees Celsius they contained 1112 heat units; therefore there was withdrawn from the charcoal 1007.7 heat units.

Since the problem is to conduct away through the medium of the gases 1,137,138 heat units from the mass of charcoal (assuming that these gases enter the condenser or cooler at an average temperature of 80 degrees Celsius), then it would require $\frac{1{,}137{,}138}{504}$ heat units, or 2256 minutes, or 37.6 hours. Naturally, the gases will have a higher temperature at the outstart when the charcoal is hottest, and a lower temperature toward the end of the cooling process than had been assumed in the calculation. The figure 80 degrees Celsius only represents the average temperature.

However, as already remarked, the cooling operation takes place also through losses of heat through the masonry. Exxperience has shown that a kiln containing 13,636 kg. of charcoal at normal temperature may be emptied without danger in about six days. If the temperature of the charcoal was 350 degrees Celsius, and if it was removed from the kiln at a temperature of 15 degrees Celsius there was withdrawn from the charcoal $350 - 15 = 335$ degrees Celsius in six days. This is equal to an average of $\frac{335}{6} = 55.8$ degrees Celsius per 24 hours, or about 183,374 heat units. Naturally in this process of cooling the loss of heat is greatest during the first day and grows less further on. The lowering of temperature of the charcoal amounted to 95 degrees on the first day, and on the last hardly 40 degrees Celsius, as was proven by several experiments carried out with the ordinary methods of cooling.

The loss in heat units amounts on an average to 13,008 heat units per hour during the first 24 hours in the case of ordinary cooling. In the case of artificial cooling it is 30,240 heat units at an average temperature of 80 degrees Celsius. Both together, therefore, amounting to 43,248 heat units, so that the charcoal may be taken out without danger in 26.2 hours.

At this occasion we may mention a striking situation in the loss of heat as it is observed in kilns when in operation. The heat transmission coefficient is considerably smaller through the brick of a kiln than it is through masonry under ordinary conditions. If we assume the thickness of the masonry of the kiln at 13 inches and take the heat transmission coefficient, as in the masonry of houses, factories, &c., of equal thickness, at 1.08 per square meter per hour, then the loss of heat with a surface of 61 sq. m. for the kiln masonry at a temperature of 350 degrees Celsius would amount to 22,069 heat units per hour. As a matter of fact, only 13,008 heat units on an average are lost through the masonry of the kiln. This peculiar fact may probably be explained in this way: that the brick, which are very porous under ordinary conditions and permit of a rapid transmission of heat, eagerly absorb the water vapors laden with tar produced during the carbonization. This stops up the pores of the brick and considerably lessens the loss in heat. Besides this, fine particles of carbon are formed on the inner surface of the walls of the kiln, thus further adversely affecting the interchange of heat.

As is readily understood from the calculations the duration of the cooling process depends upon the following:

1. Upon the composition of the gases.

2. Upon the quantity which is brought in contact with the charcoal per hour.

3. Upon the initial and final temperature of the gases.

4. Upon the quantity of charcoal to be cooled, considering the other factors to be normal.

So far as the composition of the gases is concerned we have assumed as the basis of our calculations the average result of several analyses, but as the specific heat of the gases depends upon the percentage of hydrogen, and as the cooling process develops more favorably the greater the quantity of hydrogen in the gases is, therefore the duration of the cooling process will be in proportion to the quantity thereof.

In the case of existing kilns, one or several retorts for the production of the necessary quantity of cooling gases will be required. It is desirable to carry through the carbonization of the wood as rapidly as possible at a maximum temperature so that the tar vapors are decomposed in contact with the glowing retorts. The result of this action is that the gases are enriched, through the tar, which is composed of light and heavy hydrocarbons, with a considerable percentage of hydrogen, and the desired result—to cool in a short time—is attained. It is equally clear that by increasing the quantity of gas used per minute a shortening of the cooling process is attained, and this effect is greater when the initial temperature of the gases can be reduced, or when the latter are strongly cooled.

The capacity of charcoal for absorption of gases has been investigated by de Saussure (1777-1843), who found that beech charcoal could absorb the following volumes of different gases per unit of volume:

	Volumes.
Ammonia	90
Chloride of hydrogen	85
Sulphurous acid	65
Sulphuretted hydrogen	55
Nitrous acid	40
Ethylene	35
Carbonic acid	35
Carbonic oxide	9.42
Oxygen	9.25
Nitrogen	7.50
Marsh gas	5.00
Hydrogen	1.75

Other experiments relative to absorption yielded the following result:

	Volumes.
Hydrogen	1
Oxygen	7.99
Carbonic oxide	6.03
Carbonic acid	22.5
Marsh gas	10.1
Nitrous oxide	12.90
Nitrogen	4.52

Stenhouse, who subsequently resumed the experiments, found that 0.5 gram of charcoal when brought in contact with a measured volume of gas occluded the following in cubic centimeters:

Carbonic acid	14
Oxygen	0.8
Sulphuric acid	32.5

The capacity for absorption of gases is shown by charcoal only when in a fresh condition. The occlusion of gases is usually attributed to surface attraction, which is greater or less according to the degree of porosity.*

Unfortunately the specific weight of the charcoal is not given in these experiments, so that it is impossible to draw any conclusion as to the temperature at which the charcoal was produced. As Violette has shown, the specific gravity increases with the temperature at which charcoal has been made, so that charcoal which had been exposed to a temperature of 270 degrees had a specific gravity of 1.402, while the specific gravity of coal exposed to 440 degrees Celsius is 1.709. The statement is justified, therefore, that charcoal produced at a higher temperature is denser and possesses to a lesser degree the capacity for absorption. Besides the temperature, the character of the wood from which the charcoal has been made influences the capacity for absorption of gas. Another factor is the surface exposed to the gases, so that small sized or pulverized charcoal absorbs more gases than large pieces.

* See Muspratt, Vol. III, page 946, German edition, 1876.

When the carbonizing process has been completed the gases which surround the charcoal are absorbed by the same in a very brief time, so that a vacuum is created in the kiln. Through the pressure which the atmospheric air exerts upon the surface of the kiln the air penetrates through the smallest cracks into this interior, the result being that the charcoal is sometimes ignited. For this reason the kilns must be whitewashed, the object thereof being to fill up the cracks.

With the artificial cooling method this drawback is avoided, because the constant admission of an adequate quantity of gas during the cooling prevents the creation of a vacuum. The pressure of the wood gases in the kiln is counterbalanced with that of the atmospheric air, and thus prevents the entrance of the latter into the kiln. Through the absorption of such considerable quantities of gas the pyrometric effect of artificially cooled charcoal is hightened provided, however, that the charcoal is at once discharged into the blast furnace immediately after removed from the kiln and is not kept in warm stock houses.

As analyses have shown, 1 c. m. of unclean gases contains 1039 grams of carbonic acid, while the balance of 475.2 grams can be burned. The corresponding figures in heat units, which are obtained by the combustion of the same, are as follows:

Grams.		Heat of combustion.		Heat units.
426.5	carbonic oxide	(5,607)	to carbonic acid	2,391.3
41.4	methane	(13,063)		538.2
3.8	ethylene	(13,033)		49.4
3.5	hydrogen	(34,462)		120.6
	Total			3,099.5

We know that 13,636 kg. of charcoal produced from 30 cords of wood absorb 543.9 c. m. of gases; therefore we obtain $543.9 \times 3099.5 = 1{,}685{,}818$ heat units. Assuming that for the production of 1 ton (909 kg.) of pig iron 754 kg. of charcoal (83 bushels at 20 pounds) are required, and assuming that 7500 heat units are produced by the combustion of 1 kg., we have 5,655,000 heat units (Celsius), or 6221 heat units per kilogram of iron. Then the charcoal laden with gases would yield $\frac{1{,}685{,}818}{6221}$ = 271 kg., or 596 pounds more than can be obtained with charcoal cooled in the ordinary manner.

A blast furnace consuming 72,000 kg. (about 8000 bushels) of charcoal per day would therefore produce, with artificially cooled charcoal, about 3146 pounds, equal to 573 tons more per annum.

The advantages resulting from the use of the process of artificial cooling are as follows:

About 25 per cent. in time is saved, so that the same plant of kilns can produce nearly one-quarter more of the different products, like charcoal, wood alcohol, acetate of lime, &c. The production of pig iron is increased with the same consumption of charcoal and the disagreeable whitewashing is got rid of.

In the case of existing plants of kilns which produce wood alcohol, acetate of lime, &c., according to the prevalent way, and where therefore condensers and ventilators are available, only one, or at the utmost two, wrought iron carbonizing ovens and a gas holder are required. The capacity of the latter naturally depends upon the number of kilns or upon the weight of charcoal which is to be cooled.

The kilns themselves must be equipped with an adequate number of perforated distribution pipes, the object of which is to distribute the cold gases as uniformly as possible, which would not be readily done if the gases entered only through one of several openings. The time saved by the artificial cooling method, and which naturally increases the production, changes the working method quite considerably. This may be illustrated by the following example: According to the old method there are required for a 60-ton blast furnace 5000 bushels of charcoal daily. The plant consists of 42 kilns, inclusive of six relay kilns to be used in the case of repairs or unforeseen disturbances. The entire operation—the filling, carbonizing, cooling and discharging of the charcoal—requires 18 days, of which six to seven are needed for the cooling;

in other words, 122 days, or 33 per cent. of the working year. In such a plant 12 kilns are always in the act of cooling, while the other 24 are being discharged or are in the act of carbonizing. If the cooling is done with cold gases only four kilns are required for the cooling operation instead of 12, or what is the same thing, the like quantity of charcoal and other products can be produced in 13¾ days instead of 18 days, as in the ordinary method. The production therefore increases from 138.8 bushels per kiln per day with the ordinary method to 185.1 bushels, and the quantity of wood alcohol and acetate of lime is also correspondingly increased. For an annual production of 1,500,000 bushels of charcoal a quantity of gas equal to 20,000,000 to 23,000,000 cubic feet is needed for the cooling. This calls for the carbonization of 2000 cords of wood. Of course no separate expenditure is required for the production of the 2000 cords required for the production of the cooling gases because the same quantity of charcoal and a larger quantity of wood alcohol and acetate of lime is recovered as compared with the kiln. In the case that a larger production of charcoal is not necessary the necessary quantity may be secured by simply putting out of commission several of the kilns.

The operation of the cooling process is very simple. Several hours before the cold gases are to be conducted into the kiln the ovens are heated. The gases are driven into the gas holder by the fan after having passed through the cooling apparatus. From the gas holder a clay or wooden pipe line leads to the kilns. Every battery of kilns has a main pipe, from which a branch goes to each individual kiln. The branch pipes are directly connected with the perforated distribution pipes, and outside of the kiln are supplied wth slide valves so that the supply of the cold gases may be regulated at will. When it is desired to cool a kiln the slide valve is opened, cold gases flow through the perforated distributing pipes into the hot charcoal and heat up as they cool down the charcoal. Then they are drawn out by a fan through an exhaust pipe arranged at the crown in order to be cooled down again in the condensers and driven back into the charcoal. The gases therefore flow in a circle, and this process is continued until the charcoal is cool enough to allow the kiln to be emptied.

The Markets and the Crops.

Wall Street has seemed to suffer during the present week under an accumulation of misfortune. To the daily visitor at a Stock Exchange office it may easily have appeared as if the news were developing nothing but calamity. Gold exports, crop damage advices, disturbance in neighboring money markets, the rumored approach of another coal strike and, above all, persistent fall in prices on the Stock Exchange were enough, collectively, to shake the serenity of the most tranquil observer.

It is in times like this, however, when the mercurial Stock Exchange community has begun to ask if there is anything in prospect but general wreck, that cool headed observers may usefully intrude their question as to what has really happened. We propose to seek an answer to this question.

If one surveys the general situation—we do not mean the quotations of the Stock Exchange—we suspect that he will find surprisingly little change from the position of three months ago. We have shipped some gold, as we usually do at this season of the year, and as we did at this season, it may possibly be remembered, even in 1901 and 1900. We are undergoing a process of readjustment in the position of real capital—a readjustment which was foreshadowed, as plainly as anything could be, by the outspoken descriptions of the situation months ago. We are passing through the doubts and misgivings over the outlook for the crops, as we usually do at the period of the year when one set of crops has not been harvested and another is hardly under ground. For the rest, such a survey will disclose the interesting fact that trade and industry are progressing very much as if no predictions of calamity had been heard from Wall Street. Demand from the consumer is still of so substantial a character that the attitude of labor is obnoxious to employers chiefly because it threatens to interrupt production or distribution. The characteristic of the season in this matter is, in fact, the employer's disposition to concede or compromise, rather than to bring matters to a crisis where the wheels of industry would stop.

This, we think, is a perfectly fair review of the existing situation. In so defining it, we do not profess to say that the process of readjustment visible on the Stock Exchange may not foreshadow readjustment elsewhere, where conditions regarding values have been placed on a similar inflated basis. We should not consider such readjustment a calamity in the one direction any more than in the other. But the essential question, in our mind, is whether the industrial position generally is sound or not. If it is not, then our position may be really serious. If it is, then the markets will emerge from their present troubled situation in a more healthful state than they have enjoyed for many months.

Undoubtedly the crop perplexities have been uppermost in the financial mind during the present week. This is entirely natural in view of the great importance of a profitable harvest, both to the country's genaral wealth and to its power in foreign trade. We do not, however, regard the crop situation as more vital or more critical to-day than it is in any year. Furthermore, we are inclined to think that the markets in their present mood of pessimism are drawing some premature and unwarranted inferences.

What is the situation? First, a winter wheat crop, which started out with in all respects the finest promise in a generation; for which the April estimates seemed to justify predictions of a yield greater by 125,000,000 bushels than the largest previous winter crop in the country's history. This estimate has since been cut down by the floods in the Missouri Valley, which have impaired the promise of the crop in that portion of the country. There is, consequently, no doubt that the winter crop along the Missouri bottom lands will fail to fulfill early expectations. And still no one supposes that the upland crops have been submerged, nor are there any facts as to actual damage known to-day which do not leave fair ground for relying on an abundant early yield of wheat.

The spring wheat and corn crops present a somewhat different problem. In the upper Mississippi River and Missouri River district corn has aiso suffered from the persistent rains. Accounts at hand to date do not indicate damage from this cause to the spring wheat crop; on the contrary, the crop as a whole appears to be doing extremely well. In some of the spring wheat districts and in the fertile Kansas and Nebraska corn belt there is no doubt that the planting season has been delayed. This, as is well known, is chiefly an unfavorable condition because a late planted crop is exposed, through the consequent lateness of the harvest, to dangers of autumn frosts. But it must be remembered also that, though planted late, the seed will lie in a soil so saturated with moisture as to minimize the danger of midsummer drought, and, with favoring weather through July and August, it is by no means unlikely that so rapid growth of the crop may be assured as fairly to make up for the time lost at the start.

In short, with all the vicissitudes which have beset the early crop season, we see no ground for assuming that harvests will turn out badly. Moreover, it is well to keep in mind that the tendency in the public's present mood is to exaggerate the unfavorable elements in the outlook. We shall be able to see many things more plainly a few weeks hence.—*The Commercial and Financial Chronicle.*

Now it is said that the Southern Railway Company have decided to build a belt line to connect the coal fields of Kentucky, Tennessee and West Virginia. The Middlesboro Mineral Railway, which is controlled by the Southern, is to be used as the basis of this belt line, and that road has purchased 40 acres of land near Middlesboro for use as terminals. From Middlesboro the railway is to be extended to Harlan, a distance of 30 miles. The rights of way through the Harlan coal fields have already been secured, and work will begin at once.

A New Index Head in Universal Milling Machines.

A universal indexing and dividing head for milling machines possessing several new features has just been introduced by the Cincinnati Milling Machine Company of Cincinnati, Ohio. It is made in three sizes, of 10, 12 and 14 inches swing respectively. It is arranged for making all divisions up to and including 360.

Foremost among the details, which are entirely new, are the method of taking up wear between the worm and worm wheels and the arrangement for clamping the swivel block at an angle. Angular settings of the work spindle can be made from 5 degrees below the horizontal to 50 degrees beyond the perpendicular when geared to universal machines. When fitted to plain machines it may be swiveled through a complete circle if the front index plate is removed.

The worm and worm wheel may be thrown out of mesh for any position of the work spindle by turning the T-bolt, Fig. 3, through half a turn, and this is accomplished without removing any parts, slacking up any lock nuts or disturbing any adjustments whatever. The motion of the T-bolt is positive, and it comes to a dead stop. The end of this T-bolt engages a slide attached to the worm casing, which slide is free to move endwise. The worm casing itself being confined between the walls of the swivel block, as shown in the horizontal section of Fig. 4, can only move in a vertical direction. The slide takes the horizontal motion of the eccentric end of the T-bolt. From this it will be seen that the worm moves away from or toward the worm wheel in a plane perpendicular to the axis of the worm wheel. Compensation for wear between these two members is obtained by adjusting the screws which attach the slide holder to the worm casing, all of which is evident from Fig. 3. It will be noticed that this compensation for wear is made along the same straight line in which the worm moves away from the worm wheel when disengaging, so that these parts may be adjusted repeatedly without danger of disturbing their alignment.

The method of clamping the swivel block is rather novel, and deserves attention because of its extreme simplicity. Its construction may be seen from Figs. 2, 3 and 4. The swivel block has large trunnions, Fig. 3, and it is firmly secured in any position by means of the clamping straps shown, which are made to grip the trunnions by tightening two cap screws, one of which is shown in Figs. 2 and 4. These trunnion bearings have an arc of contact of 360 degrees; they are always fully protected, no part of them being exposed at any time, no matter at what angle the spindle is set. The entire mechanism is symmetrical in design and is very rigid in its construction. There are no openings to the inside and all gears on the outside are completely covered and protected from dirt, at the same time insuring safety to the operator.

The worm wheel is larger in diameter than is usual on mechanisms of this sort.

Instead of the usual single notch on the index plate for locking there is a series of small notches milled on

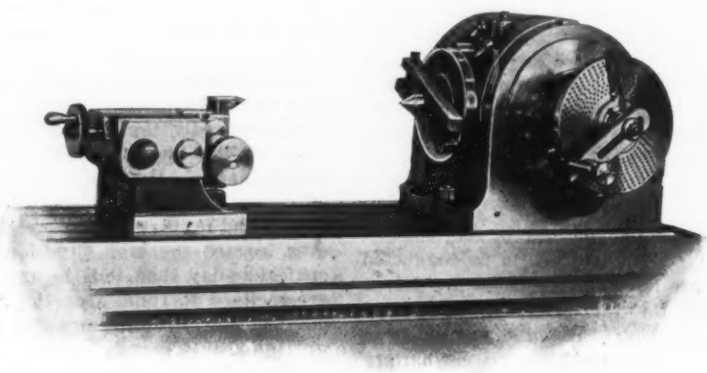


Fig. 1.—General View.

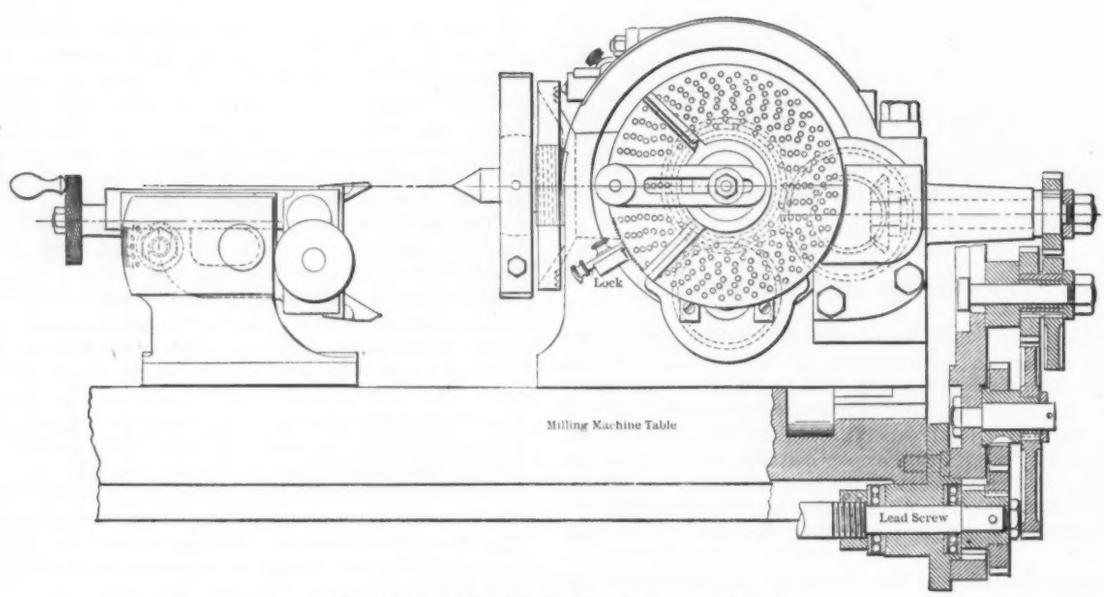


Fig. 2.—Elevation Showing Complete Arrangement.

NEW INDEX HEAD FOR UNIVERSAL MILLING MACHINES.

the edge of the plate, which permit of moving the plate a very small amount, which is very often convenient when adjusting work to the cutter.

The work spindle is provided with adjustment to compensate for wear, and it is provided with a clamping device, by means of which it can be firmly locked during cutting operations without disturbing the accuracy of the spacing.

The tail stock, shown in Fig. 2, has the usual elevating center. It may be set at any angle up to 10 degrees above or below horizontal to bring the centers in line with the center of the work when milling taper reamers or similar work.

Loss of Sulphur in Borings of Pig Iron.*

BY W. E. DICKSON, SHARPSVILLE, PA.

A few years ago I found myself obtaining high results in the determination of sulphur in pig iron. My method was the usual one of evolving the sulphur as hydrogen sulphide, absorbing the gas in an alkaline solution of cadmium salt, acidifying and finally titrating with a standard solution of iodine, the factor of which was obtained from results given by standard borings.

Turning to a number of other standards in my possession I examined them and found a loss in all those made from pig or cast iron. Those made from steel had undergone no appreciable change. The regular sample of the pig iron, reserved in the laboratory for checking in case results were questioned, showed a large loss of sulphur even though the time intervening between the first and later tests was short. Some results obtained from operation on the standards were as follows:

Standard.	Original value.	Present value.	Character of borings.
No. 1.	0.053	0.042	Borings passed over 80 mesh sieve to remove dust.
No. 2.	0.051	0.047	Coarse borings broken up in mortar to pass through 20 mesh and over 80 mesh.
No. 3.	0.040	0.028	Borings just as they came from drill.
No. 4.	0.056	0.031	Borings fine and dusty. Very old standard.
No. 5.	0.057	0.041	Borings just as they came from drill.
B	0.038	0.036	American Foundry Association standard.
C	0.059	0.048	American Foundry Association standard.
	Steel standards showed no loss.		

In borings of cast iron every particle is cracked throughout, becoming a porous mass—offering a very large surface for action of outside influences, such as acids, when attempting to dissolve the material, or air and moisture in causing oxidation. On the other hand the soft steel rolls up in a compact lump presenting little surface for the action of such influences. With this in mind it seems possible that the loss may be due to a slow oxidation of the sulphur taking place on the large surface exposed by the porous particle of iron while the surface presented for action on the steel is so small that it would be a long time before sufficient loss occurred to become noticeable.

Whatever the cause I believe it is certain that borings of pig or cast iron, even though kept with all of the care given to standards, lose very appreciable amounts of sulphur on standing, and the widespread use of the above or similar methods for the determination of sulphur should cause the fact to be of interest to chemists engaged in the analysis of iron.

After examining all details of my work without finding any source of error, I made an examination of my standard borings and to my surprise found that the standard, which was supposed to evolve 0.04 per cent. sulphur, was only giving off 0.03 per cent. Thus, after putting a portion of standard borings through the regular process of analysis, I would divide 0.04 by the number of cubic centimeters of iodine required for the final reaction to obtain my factor. As the standard proved to be giving off only 0.03 per cent. sulphur it is obvious that the factor would be one-third too high and all results obtained by its use correspondingly so.

Thinking the standard might have been improperly prepared I made up another one, using every precaution to secure a good, clean, thoroughly mixed lot of borings. After establishing its sulphur value, based on the results of a number of chemists, it was carefully bottled and sealed and stored away with the exception of a small portion needed for frequent use in standardizing.

For a time this standard gave the best of results, but after a while it began to give a higher factor than that obtained by use of a steel sulphur standard which had agreed closely with it at first. Portions from the sealed bottles showed the same change and a careful reanalysis of the standard showed that it was evolving less sulphur than the value assigned to it while the steel standard gave the same as before.

* Paper read before the American Foundrymen's Association, Milwaukee, Wis., June 9 to 11, 1903.

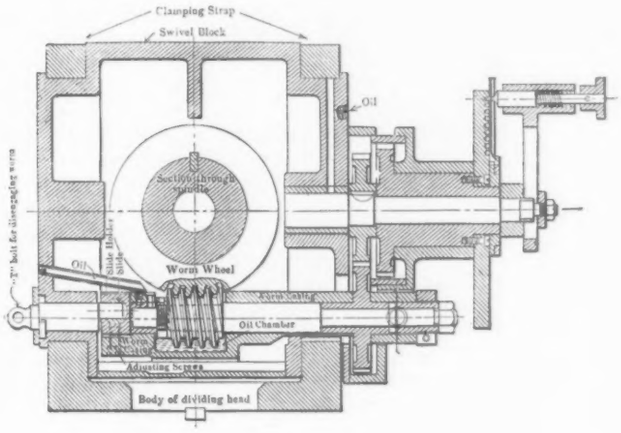


Fig. 3.

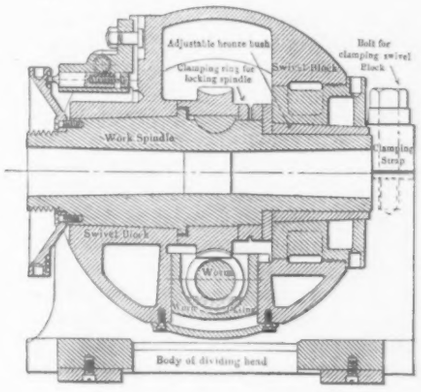


Fig. 4.

Cross and Longitudinal Sections of Dividing Head.

NEW INDEX HEAD FOR UNIVERSAL MILLING MACHINES.

The Harrisburg Pipe & Pipe Bending Company expect to put in operation three new buildings during July. Two hundred new hands will be required.

A temporary injunction has been granted the W. P. Davis Machine Company of Rochester, N. Y., restraining the members of Rochester Lodge, No. 93, from interfering in any way with their business, from picketing the streets in the neighborhood of their factory or in the neighborhood of employees' homes or boarding places, and from any acts that may tend to injure the company's business.

Canadian Notes.

Protection for Iron and Steel.

TORONTO, June 6, 1903.—On Monday, R. L. Borden, the leader of the Opposition in the House of Commons, gave notice of the following motion:

"This House is of opinion that the tariff of customs duties should give such protection to iron and steel industries as will not only secure to our own producers and manufacturers the Canadian market in articles now produced or manufactured in this country, but will also develop and sustain the manufacture in Canada of other iron and steel products which at present are imported in large quantities from other countries. And that the present tariff of customs duties should be now readjusted on this principle."

This is in accordance with the trade policy of the Conservatives, the party of which Mr. Borden is the head. Not only from the Opposition, but also from interests supporting the Government, is pressure being brought to bear upon the Finance Minister to afford more protection to the industries engaged in iron and steel making. It is probable that the proposal of the Conservative had or will be received with considerable sympathy in the Ministerial caucus, where it will be discussed before it comes up in the House. The Dominion Iron & Steel Company are making an urgent plea for more advantageous tariff duties. At the directors' meeting held in Montreal a few days ago the question of protection was taken up, and a deputation was sent to interview the Government on the subject. E. S. Cloreston, general manager of the Bank of Montreal; Hon. L. J. Forget, and Hon. Louis Beaubien, were in the deputation. There seems to be a feeling that something should be done at once, not a year hence, when it may be too late. Advocates of further protection point to the break in pig iron prices in the United States, and to the continuous offering of German and British iron to compete with American iron in the American market, notwithstanding the reduced price of the latter. In these reductions and foreign offerings the Canadian manufacturers see the premonitions of overproduction. To guard against possible slaughter prices here they desire duties on forms of iron and steel that are either not protected at all or insufficiently protected. The duty on steel rails ought not, it is contended, to be made conditional upon the proved ability of the home manufacturers to satisfy the home demand, but should be put on absolutely and immediately. There are many descriptions of iron and steel products for whose home manufacture the present tariff offers no protection. These would be provided for by Mr. Borden's resolution, which refers to them in its closing words. The idea of the Opposition leader appears to be to give effect to the wishes of the Manufacturers' Association, which calls for a complete revision of the iron and steel schedule.

Hon. J. I. Tarte, whose resignation or dismissal from the Government was in consequence of his utterances in favor of protection when he was Minister of Public Works, is now actively identified with that policy, and will work for it in the general elections, which may take place next autumn. If Sir Wilfrid Laurier does not take a similar stand his influence in Quebec will be considerably diminished, his late colleague and compatriot may win seats enough there to change the balance of power. Hence this question of protection is certain to be a prominent one in the party tactics.

Improvements at Sydney.

The mixer, billet yard and hoist which the Dominion Iron & Steel Company have had under construction for some time, will soon be completed. The capacity of the mixer will be 600 tons, and it is built upon the most up to date lines. At present the molten pig from the furnaces is carried to the open hearth in large ladles and must be used at once or it will cool. By means of the mixer it can be kept heated until the steel furnaces are ready to receive it. As an instrumentality for increasing the steel output and reducing the cost, its place in the economy of the works will be important. In the new billet yard there will be storage room of 75,000 square feet. It has an electric traveling crane 125 feet long, running on travelers each 600 feet long. By this crane billets can be picked up in any part of the yard and placed wherever wanted. At present steam derricks are used, and they are comparatively slow. The new Brown hoists are for lifting the ore into the furnaces. They are of much greater capacity than those now in use and are much quicker. All these improvements are the work of Canadian contractors. The Dominion Bridge Company are building and equipping the mixer, yard and hoist plant. Three blast furnaces and the full open hearth system are working day and night, and the output of both pig iron and steel is being steadily increased.

Quebec's Iron Production.

The annual report of J. Obalski, M. E., Inspector of Mines in the Province of Quebec, has just been published. It covers the calendar year 1902. He makes note of a sale by the Government of some extensive tracts of land in the east side of the ruin Natashquan, tracts supposed to contain deposits of magnetic sand. He makes some remarks on a process for treating these sands, the process in question having been described by Marcus Ruthenburg of Philadelphia, Pa.. Mr. Obalski pronounces the method entirely applicable to the Quebec sands. He mentions articles on the process in *The Iron Age* of September 25 and February 19 last. During the year two furnaces were at work—that of the Canada Iron Furnace Company at Radnor, and that of John McDougall & Co. at Drummondville, their total production being 7970 tons of charcoal iron.

The results of a series of analyses by J. W. Wells, C.E., are given. These experiments were conducted with the object of ascertaining whether it were probable that Quebec's immense resources of low grade ore are, much of it having titanium as a constituent, could be economically utilized. The results show a considerable elimination of titanium, but the iron contents have not been raised much, owing to rock matter adhering to the ore. Mr. Wells thinks it probable that a good shipping ore can be got from the titanic iron deposits by magnetic separation. Near water power and proper shipping facilities it would probably pay, Mr. Wells thinks, to introduce magnetic concentration.

Mesaba Ore to Be Used.

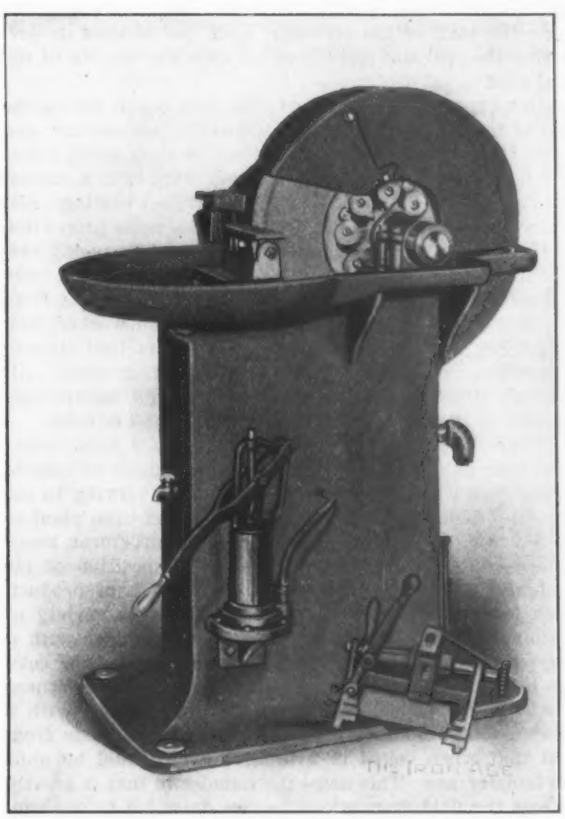
Cornelius Shields of the Lake Superior Consolidated Company said in an interview published the other day that 80 per cent. of the ore used in the steel rails of which production is to be begun next month, will be brought from the Mesaba mines, the other 20 per cent. being furnished by the Helen mine. Next year the company will probably be drawing ore from their Minnesota properties. It is described as similar to the ore of the Vermillion range, running as high as 65 per cent. Mr. Shields stated that 500,000 tons of Helen mine ore will be sold this year to buyers in the United States. Some of it, he added, is being shipped all the way to Virginia.

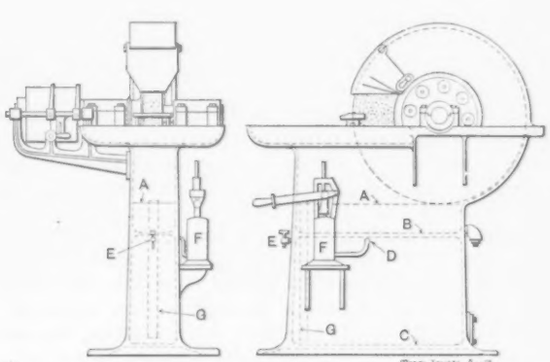
C. A. C. J.

The value of the woods in the Philippine Islands to many branches of industry is very great, for they possess qualities unknown to our own. A correspondent of the *Modern Machinist* says that one of them is an exceedingly fine grained tough wood, very useful for tool handles, while another seems to be a cross between wood and iron, for it is very heavy and resistant, so much so that the natives use it for spear heads. It can be readily worked by tools and has a metallic ring. In some cases it is wrought to shape by emery wheels. Another species is a close grained, tough wood, which seems to be a dye wood, for when immersed it stains the water bright yellow for a long distance around it. This wood is also quite heavy, and takes a fine finish. American lumbermen call it "yellow jack." Still another wood is called "Belang" by the natives, and white wood by American lumbermen, but is quite different from our own wood of that name. It can only be worked by very sharp tools, but has a veined surface when finished, and is capable of taking a high polish. The business of preparing these woods for American markets is going forward with dispatch, and it is said to be very profitable.

The Bridgeport Tool Grinder Arranged with Air Pumps.

In the new tool grinder designed by the Bridgeport Safety Emery Wheel Company of Bridgeport, Conn., the emery wheel is supplied with water by means of air pressure supplied by a pump. This pump supplies as much or as little water to the under side of the emery wheel as may be desired. The column of the machine is divided so as to form two tanks, the upper one of which supplies the wheel while the water is forced from the lower to the upper tank by air pressure. The upper tank can be very readily cleaned out when a new tank is put in the machine, and as the outlet from the upper tank is raised above the bottom of the upper tank the water that falls back is comparatively free from sediment and therefore the lower tank need not be cleaned very often. The pipe running from the lower tank is raised a little from the bottom, which prevents clogging of the pipe by any sediment that might settle in the lower compartment. The lower part of the machine can be cleaned through a door at the back.





THE BRIDGEPORT TOOL GRINDER ARRANGED WITH AIR PUMP.

Referring to the sectional drawings, A represents the water line as it comes in contact with the lower elge of the wheel. The column is divided into two compartments by the partition B. The lower compartment is provided with the bottom C, cast with the frame. The pipe D connects the lower tank with the air pump F. The water from the lower chamber is forced up through the pipe G. As this pipe extends nearly to the bottom of the tank practically all the water in this tank can be used before renewal becomes necessary.

Important Decision in Stove Case.—At Pittsburgh the courts have found in favor of the plaintiffs in the suit of the Pittsburgh Stove & Range Company against the Pennsylvania Stove Company, L. W. De Haven, Addison C. De Haven and others of Ellwood City, Pa. The action was to restrain individual defendants from continuing in the stove business, under a contract entered into when the defendants sold their interests in the stove concern of De Haven & Co., Limited, to the Pittsburgh Stove & Range Company. Under the terms of this contract the party selling out to the Pittsburgh Stove & Range Company agreed not to engage in the stove business again for a certain number of years and within a certain territory near Pittsburgh. It was claimed by the plaintiffs that this contract has been violated; in the fact, that the defendants organized the Pennsylvania Stove Company and erected a plant at Ellwood City, Pa., for the manufacture of stoves and ranges. The court has found in their favor and issued an injunction prohibiting the defendants from continuing in the manufacture of stoves and ranges.

The Duty on Cold Rolled Steel, Brightened and Polished.

The United States General Appraisers at New York have rendered a decision on the protests entered by Hermann Boker & Co., George Nash & Co. and Jos. Wilches against the decision of the collector of customs at New York on the duty chargeable on cold rolled steel, brightened and polished. The following is a summary of the decision:

The provision in paragraph 141, act of July 24, 1897, that "on all strips, plates or sheets of iron or steel of whatever shape, other than the polished, planished or glanced sheet iron or sheet steel hereinbefore provided for, which are cold rolled, cold hammered, blued, brightened, tempered or polished by any process to such perfected surface finish or polish better than the grade of cold rolled, smoothed only, hereinbefore provided for, there shall be paid 1 cent per pound in addition to the rates provided in this act upon plates, strips or sheets of iron or steel of common or black finish," is to be taken in a distributive sense; and in order to ascertain the rate upon steel strips which have been brightened to a perfected surface finish or polish better than the grade of cold rolled, smoothed only, it is only necessary to ascertain what rate or rates are provided in the act upon common or black finish steel strips; it is not necessary to consider the rates fixed by the act upon plates or sheets of iron or steel of common or black finish.

Cold rolled steel strips which have been brightened or polished to a perfected surface finish or polish better than the grade of cold rolled, smoothed only, are dutiable under the provisions of paragraph 141 of said act at the rate of 1 cent per pound in addition to the rates imposed by said act on common or black steel strips of corresponding gauge and value.

Without exception the press comments made upon the recent Paris to Madrid automobile race condemn not only its management, but the practice itself. It is admitted that one automobile can run faster than another automobile, but this knowledge having been gained there seems to be no practical value in it, except as an advertisement for the swiftest vehicle. Whether this is sufficient to justify the peril to life and limb of spectators and drivers alike is not at all problematical.

Retort Oven Coke for Foundry Use.*

BY W. J. KEEP, DETROIT, MICH.

My excuse for saying a few words on this subject is that for a year and a half I have used retort oven coke exclusively, melting about 80 tons of iron per day. I have used coke made at three different plants, from Hamilton, Ohio; Sharon, Pa., and Detroit, Mich. This coke was made from a great variety of coals from West Virginia and Pennsylvania. The coke used during 1902 was made in Detroit, Mich., and was uniformly good. At times during January and February of this year we received some coke that was not satisfactory because the makers could not procure proper coal owing to transportation difficulties. When this condition changed the coke again became satisfactory and has continued to be so.

During these same early months of 1903 founders all over the country had trouble with coke made in beehive ovens. Founders in many parts of the country were obliged to take any kind of coke that they could get in order to keep running. During the past season most of the best deposits of coking coal in the Connellsville region have been purchased by the United States Steel Corporation and very little genuine Connellsville coke is available for general foundry use.

It may be interesting to describe in a few words the old fashioned beehive oven and the newer retort oven. The beehive oven takes its name from its interior having the shape of the old dome shaped beehive. The size is generally from 8 to 12 feet in diameter and from 6 to 8 feet high. The coal is charged through a hole in the top and is spread evenly over the floor to a depth of 18 to 28 inches. There is as much space left over the coal for the burning of the gases as is occupied by the charge of coal. The brick work of the oven being still hot from the heat of the previous charge soon causes the fresh charge to ignite and distill off the gases, which are burned in the dome above the coal. The heat being reflected downward causes the distillation to gradually proceed toward the bottom of the coal. When all the gas is driven off, which takes from 48 to 72 hours, the coke is quenched while yet in the oven.

The bright glistening surface of Connellsville coke is principally due to this quenching inside the oven and the columnar structure is due to the gas rising vertically as the coking proceeds downward. Blackheads are the lower portions of the charge that rest on the floor of the oven and which are not thoroughly coked.

The retort oven is a closed chamber from 15 to 24 inches in width, from 5 to 8 feet in hight and from 25 to 45 feet in length. From 25 to 50 of these ovens are placed in a battery. The coal is charged through three or more openings in the top and leveled off to within a foot of the roof, after which the oven is carefully closed and sealed in order to exclude the air. The oven is heated by the combustion of a portion of the gas driven off in the process of coking. This is not burned in the oven itself, but is burned in flues constructed in the walls of the individual ovens. The heat is conducted through the walls of these combustion flues to the charge of coal and distillation thereof is started immediately. The gas which is driven off is conducted through a series of apparatus in which the tar and ammonia are recovered, after which a portion of the gas is returned to be burned in the oven flues and the balance is disposed of as local conditions determine.

Distillation proceeds from the side walls toward the middle of the oven and the gas is probably driven toward the center of the oven, where it rises, forming a cleavage plane the whole length of the oven. When the process is completed, which takes place in from 20 to 36 hours, depending upon the width of the oven and the temperature maintained, the whole charge is pushed out by a steam electric ram and is immediately quenched. The oven is at once closed and without any loss of heat from the oven itself is again charged with coal.

On account of the cleavage plane through the center of the charge no piece of coke can be longer than half the width of the oven. Owing to the complete exclusion of air there is no combustion in the oven, and as the temperature of the oven when the coal is charged is very high there is a considerable decomposition of volatile matter with consequent deposition of carbon upon the coking charge; as a result the yield of coke is a little higher than the theoretical yield as calculated from the analysis of the coal. Quenching the coke outside the ovens mars the appearance of the coke, somewhat destroying its bright silvery luster, but probably results in carrying off an appreciable quantity of sulphur.

It is evident from a comparison of these two methods that coke made from the same coal will have a slightly higher percentage of fixed carbon and a slightly lower percentage of ash if made in a retort oven.

The beehive oven is almost universally located at the mines from which it draws its supply of coal. Retort ovens are located in places that provide a market for the coke and gas. To allow a continuous operation of a retort oven plant the product must be sold as fast as made, and to do this a uniform quality of foundry coke must be maintained. The quality of retort oven coke depends upon the skill of the operator, upon the method of preparing the coal and more than all upon the quality of the coal used.

Our experience with retort oven coke began during the fall of 1901. We were at first induced to try one car, and when it arrived it was so black and in such small pieces and looked so badly that we refused to try it in a cupola, but the makers proposed to pay for all poor castings, and under these conditions we used it in the same proportion as the Stonega beehive coke that we had been using previously. The iron was very hot and satisfactory. We ordered five cars more and ordered retort oven coke from other ovens until we decided that the coke worked well in spite of its very bad appearance. From that time to this we have never had a pound of other coke. All through 1902 the coke was so uniform and satisfactory that we melted 9 pounds of iron with 1 pound of coke.

There is a great advantage in having a local retort oven coke plant, because it enables the founder to keep in close touch with the source of his supply. Owing to the necessity of having a laboratory at a retort oven plant to keep track of by-products the coke manufacturer keeps himself informed as to the chemical composition of his coal and coke and can make a very uniform product. Such local coke plant will have a very large variety of customers and therefore can supply the founder with a very uniform quality of coke because any inferior coke can be sold to domestic users or to manufacturers where it will do no harm. Experience has proved that with a retort oven satisfactory foundry coke can be made from coal that when coked in a beehive oven would be unfit for foundry use. This helps the founder in that it greatly widens the field from which he can draw his future supply of fuel. Retort ovens are at present being erected in various cities, and I understand that an 80-oven plant will be in operation in Milwaukee in a few months. This will be a great relief to the founders of this city.

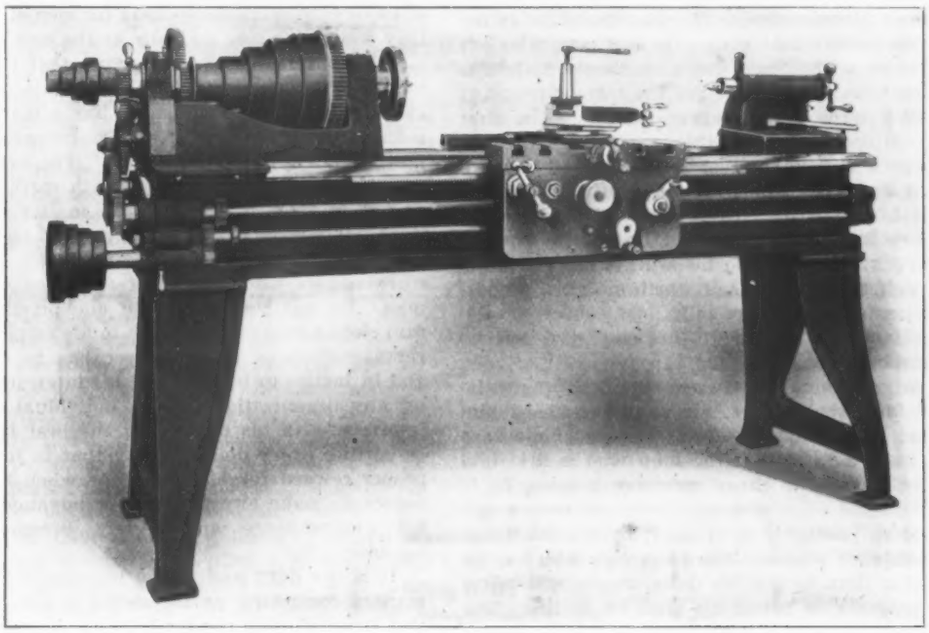
* Paper read before the American Foundrymen's Association, Milwaukee, Wis., June 9 to 11, 1903.

Alcohol as Fuel for Internal Combustion Engines.—Tests made by C. W. Weiss at the Mietz & Weiss Engine Works, 128-138 Mott street, New York City, with Cuban and Brazilian cheap alcohol as fuel in their standard kerosene engine have been reported as entirely satisfactory. The object was to substitute alcohol for kerosene, the former being considerably cheaper and more readily obtainable in Cuba and South America, where many of these engines are shipped. It was found that a mixture of 4 pints alcohol and 2 pints water developed 4 horsepower for one hour. The mixture of alcohol varies, however, with the quality of the former being limited by the practical degree of compression prior to combustion. The specific gravity of the mixture is 0.9; that of the pure alcohol was 0.794. The development of the alcohol engine is of the greatest importance to the power question of Cuba, Brazil and the Philippine Islands.

A large German steel mill proposes to take up a very interesting line of work. It is proposed to operate open hearth steel furnaces with waste blast furnace gas. The latter is first to be driven through gas producers, and is then to be used for heating the open hearth furnaces.

The Von Wyck Engine Lathe.

A new screw cutting engine lathe has just been placed on the market by the Von Wyck Machine Tool Company of Cincinnati, Ohio. At present only one size is built. It is of 15 inches swing and 6-foot bed and is illustrated in the accompanying engraving. The bed stock is made strong enough to obviate any tendency to chatter and vibrate under the heaviest cut, and is not weakened in making room for the face plate. The spindle is made of high grade crucible steel. The hole through the spindle is 1 13-16 inches in diameter and is bushed for Morse taper No. 3, the front bearing being 2¼ x 4 inches and the back bearing 1 13-16 x 3 inches. The apron is so arranged that the friction feed and lead screw cannot be engaged at the same time. The feeds are driven directly from the spindle, either with change gearing or belt, and in either case are reversed in the apron. The chasing dial permits thread to be chased without stopping the machine or reversing the lead screw. This arrangement obviates the need of a backing belt. From 5 to 40 threads to the inch can be cut. The cone, it will be noted, has five steps. The largest is 9¼ inches diameter. The back



THE VON WYCK ENGINE LATHE.

gear ratio is 10 to 1, and the cross feeds are graduated to thousandths of an inch.

The success of macaroni wheat in this country is a matter of great importance to grain growers. It has been demonstrated that not only is the yield greater than common wheat, but it brings a much higher price and thrives in localities where ordinary wheat fails or gives but a scant yield. In South Dakota, where the experiments were carried on, from 60 to 120 per cent. more macaroni wheat was grown than that given by the blue stem or Fife wheat, and where 150,000 acres were sown with it last year 300,000 are under cultivation this year. Last year was an unfavorable one for this variety, much of the crop being injured by rain and sleet. In spite of this the yield was 80 per cent. greater than the regular crop. Macaroni mills abound in Minnesota, Dakota, Pennsylvania and New York. To keep them going thousands of bushels of macaroni wheat were imported; even with this they were compelled to use bread wheat to some extent, which results in a lower grade of goods. This high grade wheat makes far better and more palatable bread than that generally used, so it will be in demand for that class of work. It is stated by Professor Carleton, the macaroni expert in this country, that the wheat crop can be increased 50,000,000 bushels readily by more attention to the subject.

To Investigate the Development of the Steam Turbine.

In addressing the National Electric Light Association, which held its annual convention at Chicago last week, President L. A. Ferguson said:

"There is probably no piece of apparatus in the construction of the central station at the present time the results of which are awaited with such keen interest by central station managers as the steam turbine. We have arranged for the presentation of a paper on this subject by a man who has had much experience in the operation of one type of turbine, and the discussion will be led by others who are especially versed in the subject as far as they, as manufacturers, have been able to acquire knowledge. Yet I feel that we will not have exhausted the subject at the close of this convention, and when we stop to consider that two manufacturers of steam turbines in this country have taken orders in 12 months for approximately 540,000 horse-power capacity you may realize what an important factor it may ultimately become in our business. It seems wise, therefore, that we should not rest with the information these distinguished gentlemen may give us at this convention, but we should appoint a committee of three good mechanical engineers to follow the development of the steam turbine during the coming year and report the results at the next convention.

"There is a growing demand for electric power in factories, and it is important to central station companies that this business should be obtained for their service. Statistics showing the useful and economical application of electricity in factories, together with costs at various rates per kilowatt hour, are not readily obtainable, and I would recommend the appointment of a committee of three men from different sections of the country to gather statistics on 'purchased electric power in factories,' and report at the next convention, or sooner, if found feasible."

In accordance with the president's recommendation, a committee was appointed and $1000 authorized to be expended in an investigation of the subject of steam turbines.

By systematic management the actual time for making one white shirt has been reduced to six and one-half minutes. A machine cuts out 300 shirts at one time, and by machines a woman can produce 1280 buttonholes in a working day.

What Is for the Best Interests of the Workingman in His Relation to His Employer and to the Labor Union.

BY THOMAS COLDWELL, NEWBURGH, N. Y.

My interest in workingmen and my desire to see this problem properly and speedily solved prompt me to write this article. I do so the more readily since I have had a long, practical experience, both as employer and employee, and have never had any difference in either capacity that I was not able to settle in a satisfactory manner without the help of a third party. Since I have always had the confidence and respect of both my employer and employees, I have reason to think that my theories on this question are sound and practical, and if faithfully carried out would remedy many of the vexed questions between capital and labor. I do not propose in this article to discuss this question in all its phases, but simply take up two fundamental points:

1. What is for the best interest of the workingman in his relation to his employer?

2. What is for the best interest of the workingman in his relation to labor organizations?

First, then, I think a workingman should be a man in the broadest sense of the word. He should be as far as possible an independent man. He is a man who has certain rights as a workman, which he should maintain. He is a man who, in order to get his correct bearings (in his relation with his employer), should realize that he has certain commodities, either mental or physical, or both, which it is to his interest to develop and improve in order that he may get the most out of them, both for himself and his employer. To this end, it is his duty and to his best interest to do a good, honest day's work. It is also to his interest to do his work well. It is his duty to himself to make himself worth as much as possible, both mentally and physically. Of course, by doing this, he incidentally benefits his employer, but he benefits himself far more.

The honest workman always gets the best wages; he can always find employment; his employer keeps him at work when others of less value and cheaper men are laid off. I have noticed that the man who is first laid off in slack times is the cheap man, not because he is cheap, but because such men as a rule are poor workmen and not so profitable to the employer as the men who receive higher wages. The workman who has no other ambition than to get his daily wages will never make any progress or better his position in life. The workingman who is continually afraid that he will earn more than he gets will never get more than he earns, except he can get some organization to back him up in his unjust demands.

The idea that many workmen have, that all employers are trying to get out of them all they can for the least possible wages, is absurd, and the employer who does it simply does so against his own interest. For my part, I fully believe in high wages where a workman earns them and deserves them. Of course, it is easy to understand that higher wages are a benefit to the workman, but it is hard for some people to understand how they can be of any great benefit to the employer.

Let me illustrate: If I have two men in my employ who may be doing the same kind of work, and one of them accomplishes one-third more labor than the other, he certainly deserves one-third more pay as a recognition of his merit and as a matter of justice. This illustration is no exaggeration in regard to the merits of different workmen. It would seem at first sight that these two men were equally profitable to me, because I paid them according to the amount of work they had accomplished; but it is not true. If either of these men in a slack time were to be laid off, the cheap man would be the first to go, because the high priced man is the more profitable to me and, as a rule, he does the best work. If I am paying one $2 per day and the other $3 per day, and making a profit on each of them of 20 per cent., it is easy to figure that the high priced man earns for me above his wages 60 cents per day, while the low priced man is only earning for me 40 cents per day. They both use up the same power and about the same room in the shop. As a rule, the better and higher priced man needs less looking after and gives less trouble. This being the case, it can be readily seen why I have good reasons for believing in high priced workmen.

I can imagine that some workman who has always had the impression that his merit was never appreciated and that he never received quite as much wages as he thought he should have, will say: "If my employer is a grasping man and will not pay as much wages as I demand, how am I to get my wages raised?" As a rule, such men do not deserve higher wages; their merit is largely in their own mind. Workmen of real merit do not have to tell it so that it be known, and the employer, if he is looking after his own interest, will see it about as quickly as any one else. However, where there is a real difference in opinion in a case of this kind and a man feels that he is not getting his just deserts, the proper redress is to get another place, where his merit will be appreciated and where he will receive a fair remuneration for the same. I am aware that some will say it is not an easy thing to do, as men cannot always pick up a job when they want it; but this is another great mistake that workingmen make. In every class of labor employers are looking for men of real merit, and they want such men as badly as the men want them.

I have found in my experience that the workingman who does an honest day's work, and does his work well, can always find work. He is like a manufacturer who manufactures the best goods; he is generally busy, no matter how dull the times are. The astonishing thing to me in my long experience with workingmen is that so few of them realize that the matter of their getting good pay and plenty of work in good positions depends more upon themselves than upon their employer. The workingman who has merit becomes an independent man. He has the same right and privilege (under certain circumstances) to dictate to his employer as regards remuneration as the employer has to dictate to him, and in justice to himself and his interests he should not let any organization or any individual or any society interfere with his developing the best there is in him, or getting every dollar of pay that is justly his as the proper reward for his merit, for when he does this he ceases to make any progress or advancement; he loses his independence and merely becomes a working machine.

It is the duty and to the interest of every workingman to contribute as far as he is able to the success and reputation of the business in which he is engaged. True, in so doing he incidentally helps his employer, but if he does he helps himself also. Every workingman wants to work for a successful concern, where he is sure of steady work and good pay. This being the case, he can, and should, contribute to the success of the concern by doing his work well and by doing an honest day's work. Workmen would get on better with their employers if they could realize that their interests were mutual—what affects one affects the other, and what benefits the one must be a benefit to the other. I have no patience with workingmen who are continually harping on the string that the boss is making more money than they are. Of course, he is; he deserves to; he takes all the risk and care; he has furnished all the capital. The workman never furnishes or risks a dollar in the business, and his only care is to get his pay at the end of the week.

Of necessity there are two sides to the question; the employer has one side and the workingman the other, and the sooner that employers and employees understand and act on this principle the sooner they will come to a better understanding. Any arbitration or laws or rules that are made by either party not based on the principle of mutual interest will utterly fail, and labor agitations will continue to the detriment of both parties and greatly interfere with the business prosperity of the country.

This leads me to the consideration of a second point, which is, the relation of the employee to labor organizations. I am aware that this is a still more difficult prob-

lem to solve than the first which I have been considering. It is a very difficult matter to give an opinion or advice on this part of the question, as it is surrounded with so many difficulties and varied circumstances that any given rule might be proper and work well in one section or country while it would utterly fail in other parts where circumstances are entirely different. Yet a few general rules might be suggested that would be applicable under all circumstances; and I would have it definitely understood right here that I am not writing this article in opposition to any labor associations or unions, except where they interfere with the success, the progress and the general elevation and independence of the workingman. This would seem to suggest an anomalous condition, as it is generally supposed that a labor organization exists solely for the benefit of the workingman. I have no doubt that it was originally intended that this should be so, and yet it is possible and very probable that there are but few organizations that have not at some time in their history dug a pit, intending that some one else should fall into it, and they have fallen into it themselves. Under the impulse of the excitement caused by their success in gaining victories over those who were opposed to them, they have become reckless in their demands and actions, and have insisted on making certain rules which were not based on justice and equity as between themselves and their employers. To these the employer has been compelled to accede, not because he thought it was right, but simply because he needed labor and must have it as almost any price or on any terms. These organizations seem to forget that any demand or rule they may make that is not based on true justice and equity to both parties concerned will surely react upon them at some time. The sooner they learn to consider the interests of their employer when considering their own interests the sooner they will come to a satisfactory and permanent solution of the differences between capital and labor.

Our country for some years past has been enjoying an era of unprecedented success. Our manufactories have been overrun with orders, and the prices for all kinds of manufactured articles have never been better. This has led to a great demand for labor of all kinds, and it is during this era of success, of demand for labor, that many labor organizations have made arbitrary demands on their employers, knowing well that under the existing circumstances they had the power to insist on these demands, as the employers were completely at their mercy. They do not seem to have counted upon the fact that these times and conditions will not always last, and that when the reaction comes, when trade is dull, and, as is often the case, when the manufacturer would just as soon close his shops as not for all the profit he is making, many of the rules and regulations made by labor organizations during the prosperous times will become a dead letter. Then will be the time when the manufacturer will be in a position to dictate terms. The tables will be turned then. A threatened strike will not intimidate him in the least, for we have seen times when it would be more profitable for some manufacturers to have their works closed for a few months than to have them running.

But I wish more particularly in this article to show that while many of the rules laid down by labor organizations are against the interests of the capitalists, they are far more against the interests of the workingman himself; for if he cripples capital he is crippling his partner, for capital and labor can only successfully live as two great partners, both contributing to the success of any enterprise.

Let me just here point out a few rules established by labor organizations and try to show how they are detrimental to the interest and success of the workingman. First, take the rule which exists in many places and labor organizations, that in certain trades the workman shall receive a uniform rate of wages. I am well aware that this is a good rule to help the lazy and worthless workman, but what sort of justice is there in it to the workman of greater ability? He certainly must have the feeling that, if the poor workman who cannot do as much or as good work as he can is getting the same amount of wages, he is being unjustly dealt with. He knows that he is earning more money and deserves more money than the other man, and yet, according to the rules of the organization to which he belongs, he is deprived from getting it. This being the case, he loses all incentive to do more or better work. He loses all ambition to attain any higher position, for his position is fixed, his remuneration is fixed, and he has fixed it himself through the organization to which he belongs. "Well, but," some one says, "this is his own fault." Not necessarily so, for I know that many men join these organizations not of their own free will, but simply because they are compelled to in order to obtain work, for there are many shops in which they could not obtain work unless they belong to the union. Thus a man loses his independence, and he descends into a mere machine, putting in so many hours for so much money.

This is plainly seen by the workingmen in England, where labor organizations have existed for a much longer period than they have in this country; and long enough to have fully developed the legitimate results of such organizations. And what are some of these results? One is that the English workingmen have objected to all kinds of inventions and new machinery, which they mistakenly thought would interfere with their labor. This opposition they have carried to the extent of breaking up new machinery or tools, or of refusing to work until such machines have been taken out of the factory. Thus the manufacturer has been crippled and handicapped in his competition with other nations, and while our own country is largely benefited by this, England has lost her former prestige as a manufacturing nation. Not only has England lost her trade in other countries that she was supplying, but she has lost much of the trade in her own country, and this is largely because other countries have adopted new machinery and tools, and have produced a far more intelligent and better class of workmen than England has. The English workman has descended to-day into a mere machine, with no higher aim or ambition than work and wages. He does not even have to give himself any concern about these, for the labor organization regulates both.

There is no question in my mind that the system of uniform wages is disastrous to both the workingman and the business. There is no true and permanent basis upon which to settle the wage question, except the real merit of the workman. The proper adjustment should be determined by the employer and employee, as they are the two parties interested.

Another rule in some labor organizations which I consider unjust to many workingmen, and one which certainly cannot be maintained when times are dull and there is but little demand for labor, is that of the dictation to the employer whom he shall and whom he shall not employ. This rule is certainly an injustice to the employer when he needs workmen. It is also unjust to those workmen who need employment, for they are simply debarred from securing work because they are not members of some particular organization. A rule like this may be enforced for a time when there is plenty of business and when workmen are in demand, but it certainly cannot be enforced in dull times when workmen are plenty. The attempt to carry out this rule recently in the cash register works in Dayton, Ohio, did more harm to labor organizations than all the strikes and opposition that had ever preceded it. The press and the people of almost the entire country saw the injustice of the strikers' position in this case and cried out against it. In fact, I think the men themselves who went on strike on this occasion were ashamed of their position. This rule, like many others not based on justice and equity to both parties concerned, can never permanently stand, and as long as a rule of this kind exists there never can be real harmony between the employer and the employee.

Some may naturally ask if I am opposed to labor organizations? I answer decidedly that I am not. I believe in them when they are carried on for the purpose of helping and permanently benefiting the workingman. I think this should be the legitimate purpose of

every labor organization. Their purpose should be not only to help him in sickness or distress and to maintain his rights where they are trampled upon by his employer, but their aim should also be to make him a better workman, and to encourage him in every legitimate way to higher and better positions in his business. I have no sympathy with any labor organization that is used to take undue advantage of the employer. A defensive warfare is generally justifiable, but an aggressive one is rarely so, if ever.

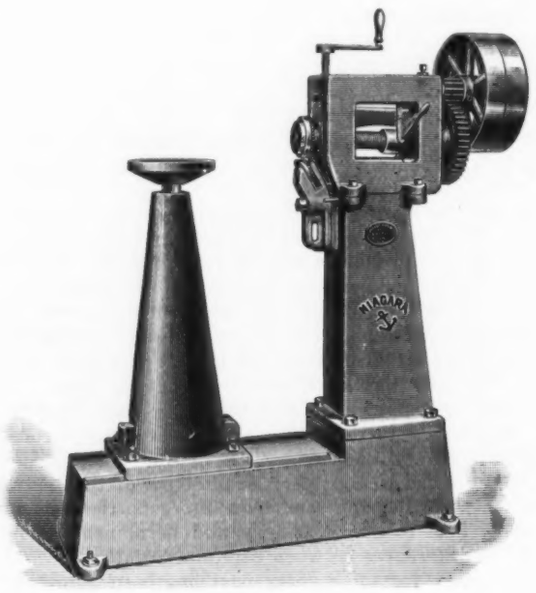
I can imagine that some one just here asks the question if I employ union men? Certainly I do. In fact, I do not know the difference between a union man and a nonunion man when he comes into my employ. They are all treated alike as far as I can judge, and no partiality is shown to either. I would as soon think of asking a man about his religion or his politics when he applied to me for work as I would of asking him if he belonged to a labor or any other organization. So long as he does not interfere with the rights of his fellow workmen or with my rights as an employer we get on very well together; but if any man in my employ should begin to dictate to me about what I should do or not, or whom I should employ or not, I should at once heartily protest, and tell him he had better find employment in some other place.

I have spent a large part of my life in manufacturing, and it has been about equally divided as an employer and an employee. During this time I have never been connected with a labor organization or a capital organization. When I was a workman I stood individually on my own merit. I realized from the start that the more and better work I could do the more I was worth to myself and my family and my employer. If there was a difference of opinion between myself and my employer in regard to the remuneration I should receive, I felt perfectly justified in leaving him and finding another position where I could realize what I thought was justly due me for my services, or where there was a greater opportunity for my own advancement. Working on this principle, I was always able to obtain a good position and good wages. Since I have been an employer I have tried to treat my men on the same principle, and to reward every man according to his merit. I have always tried to put myself in their place and treat them as I should like to be treated under like circumstances Their welfare and their comfort and their success I am always interested in. I try to anticipate their wants and to meet them sometimes before they have themselves discovered the necessity or desirability of any change. Working on this plan, I think I have the good will of every man in my employ, and the feeling is mutual. We have never had a general difference of opinion in all the years we have been together. We have never had a strike or the shadow of one to my knowledge. In fact, I think we feel as nearly as employer and employees can feel that our interests are mutual. I am well satisfied that the adoption of this principle by employer and employee will do more to solve the vexed questions between capital and labor than any other plan, or all other plans combined. Let every workman stand firmly on his merit, and he will find it the great underlying principle of advancement and success. Let every employer reward his employees according to their merit, and he, too, will find this the best principle on which to build up a prosperous and successful business. Let him treat his employees like human beings rather than as mere machines; let him treat them as men who have rights and feelings and sympathies; let him occasionally put himself in their place, and then we shall have less cause for strikes and less feeling and contention between capital and labor, and each will realize that their interests are mutual.

Drawback will be paid on solder made from imported lead and tin by Marks, Lissberger & Sons of New York, on harvesting implements manufactured from imported pig iron and steel billets by the International Harvester Company, and on brake shoes manufactured from imported pig iron by the International Brake Shoe & Foundry Company.

The Very Heavy Hulbert Double Seamer.

A double seaming machine, power driven, and provided with setting down attachment, has been placed on the market by the Niagara Machine & Tool Works of Buffalo, N. Y. It is intended for seaming bottoms of large cylinders made of comparatively heavy material. It works on the Hulbert principle, which has been successfully used on lighter work for many years. The setting down attachment compresses the edges prepared previously by means of burring machines. The diameter of the seamer disks can be varied according to the size of the work, which is carried by the standard, which is held firmly in place. The machine is made for work up



THE VERY HEAVY HULBERT DOUBLE SEAMER.

to 36 inches high, in which case it will answer for No. 18 gauge iron and lighter, or for work up to 48 inches high for No. 22 gauge iron and lighter.

Electricity in Railroad Shops.

The following is a communication to the *Railroad Gazette* from R. D. Hawkins, mechanical engineer of the Great Northern:

In selecting proper drives for our new shops at St. Paul, at our Western shops at Havre, Delta and Spokane, I took up the matter of individual and group motor drives, and decided to install group drives rather than individual drives, unless a machine required more than about 7½ horse-power and was to be run intermittently. The results at the Western shops show quite a saving for the electric drives. We attribute a large part of this saving to the decreased friction of line shafting, for in a long shop of wooden construction it is quite an art to keep all the shafting lined up properly. On short groups this can be more easily accomplished, besides there are certain sections in repair shops where the machines in the groups are not running continuously. This is particularly true where several large planers are grouped, as the motor can be shut off while work is being put in place and set on the planer bed. There are other machines which can be picked out, which do not run continuously. Of course, in the modern shop the wheel and tire machinery are run nearly all the time.

In regard to the strength of the machine tools not being up to date or not being as strong or heavy as required for the present tool steel, I agree with you that we have a great many old tools in our shops which are too weak and which cannot stand the strain which could be given them when using the best grade of modern steel. I find that the new tools which we have received have been strengthened considerably, but we have been

unable to reach the limit of the best self hardening steels, on account of the vibration of the machines.

Our experience with electrically driven repair shops warrants me to say that the application of the electric motor, especially where shops are remotely located from each other, institutes quite a saving, especially on account of being able to put up a modern and economical isolated power house and get less transmission losses.

Bids for Three Battle Ships.

WASHINGTON, D. C., June 9, 1903.—Bids for the construction of the three 16,000-ton battle ships, to be known as the "Minnesota," "Vermont" and "Kansas," authorized by the naval appropriation act of March 3 last, were opened at the Navy Department on the 3d inst. in the presence of the representatives of the leading shipyards of the country, the manufacturers of armor plate and producers of other material, including C. B. Orcutt, W. A. Post, A. L. Hopkins and L. E. Payson of the Newport News Shipbuilding & Dry Dock Company; Charles Cramp and Gen. George Williams of the William Cramp & Sons Ship & Engine Building Company, De Courcey May and D. M. Tweed of the New York Shipbuilding Company, Richard Deming and C. C. Wells of the United States Shipbuilding Company, T. A. Watson of the Fore River Shipbuilding Company and E. M. McIlvain of the Bethlehem Steel Company. The bids, which were opened by Judge Advocate General Lemly, assisted by Chief Engineer Melville and Admiral O'Neil of the Ordnance Bureau, were as follows:

Newport News Shipbuilding & Dry Dock Company, Newport News, Va.; one vessel on department's plans, delivered in 42 months for $4,110,000.

New York Shipbuilding Company, Camden, N. J.; one vessel on Department's plans, delivered in 42 months, for $4,165,000.

Fore River Ship & Engine Building Company, Quincy, Mass.; one vessel on department's plans, delivered in 42 months, for $4,179,000.

William Cramp & Sons' Ship & Engine Building Company, Philadelphia, Pa.; one vessel on Department's plans, delivered in 42 months, for $4,190,000, or two vessels on the same plans, delivered in 42 months, for $4,181,000 each.

Eastern Shipbuilding Company, New London, Conn.; one vessel on Department's plans, delivered in 42 months, for $4,192,000.

The officials of the Department were disappointed in not receiving a larger number of bids, and also because only one company submitted a bid for more than one vessel, but on the whole the figures presented in the proposals are very satisfactory, all of the lowest three bids being $33,000 below the limit of cost fixed by Congress. The bid of the Newport News Shipbuilding & Dry Dock Company, which was the lowest submitted, and which was $102,000 under the limit, was a surprise to the naval experts, but this company are understood to have been able to submit this low figure because they are at present engaged in the construction of the "Louisiana," a sister ship to those advertised, and have on hand a complete equipment of detailed drawings, patterns, templates, &c., and will be able to build the two vessels alongside each other at a very considerable saving. While all the contracts which the Navy Department is now making contain a carefully written "strike clause" for the protection of the contractors, yet the statement was made by representatives of several of the bidders that they would have been glad to undertake the construction of two battle ships instead of one, but for the disturbed conditions in the labor market.

Features of the Vessels.

The vessels covered by these proposals are expected to excel in certain particulars any battle ships thus far built for the United States. They will have a length of 450 feet by 76 feet 10 inches beam, with a displacement of 16,000 tons and a draft of 26 feet 9 inches. The coal capacity will be 2200 tons, and the speed requirement is fixed at 18 knots, with heavy penalties for failure to reach that requirement, and provision that if the speed falls below 17½ knots the vessels may be rejected in the discretion of the Secretary of the Navy.

Special specifications were prepared by the Bureau of Steam Engineering for the boilers of these vessels, which exclude the Niclausse type or any other in which the Field or internal tube is used. These specifications provide in part as follows:

There will be 12 water tube boilers, placed in six water tight compartments, as shown. They will have not less than 1100 square feet of grate and not less than 46,750 square feet of water heating surface. The working pressure will be 265 pounds. The length of grates will be about 6 feet 9 inches. The steaming capacity will be such that all steam machinery on board can be run at full power with an average air pressure in the fire rooms of not more than 1 inch of water. All parts of the boilers subject to pressure will be of wrought steel. There will be no screw joints in contact with the fire. No malleable or cast iron or cast steel will be used under pressure. Generating tubes will be straight and inclined downward toward the front of the boiler. They will not be less than 2 inches in diameter, without return bends or junction boxes, and without "Field" or internal tubes. The tubes will be in groups of four or less, and will be expanded at their ends into two vertical or inclined wrought steel headers, which will be sinuous in shape, for the purpose of staggering the groups of tubes. Each header will be provided with openings, placed opposite each end of each tube, of sufficient size to permit the inspection, cleaning, removal and renewal of a tube through the same. There will be a horizontal baffle plate over the lower row of tubes, extending back from the front, and leaving at the back of the boiler sufficient area for the escape of the gases. There will be baffle plates in the boilers, so placed as to make the gases at right angles to the tubes. All the necessary auxiliaries and accessories will be provided for the efficient working of the boilers.

The armament of these vessels will consist of a main battery of 4 12-inch, 8 8-inch and 12 7-inch breech loading rifles, and a secondary battery of 20 3-inch 14-pounder, rapid fire guns, 12 3-pounder semiautomatic guns, 6 1-pounder automatic guns, 2 1-pounder semiautomatic guns, 2 3-inch field pieces, 2 machine guns, caliber 0.30, and 6 automatic guns, caliber 0.30. The main battery will be mounted as follows: The 12-inch guns in pairs, in two electrically controlled, balanced, elliptical turrets, on the center line, one forward and one aft, each with an arc of fire of about 270 degrees; the 8-inch guns in pairs, in four electrically controlled, balanced, elliptical turrets, two on each beam, at each end of the superstructure, and the 7-inch guns in broadside, on pedestal mounts on the gun deck behind 7-inch armor, each gun being isolated by splinter bulkheads of nickel steel of from 1½ to 2 inches thick; forward and after guns arranged to fire right ahead and right astern, respectively; other 7-inch guns to have the usual broadside train.

W. L. C.

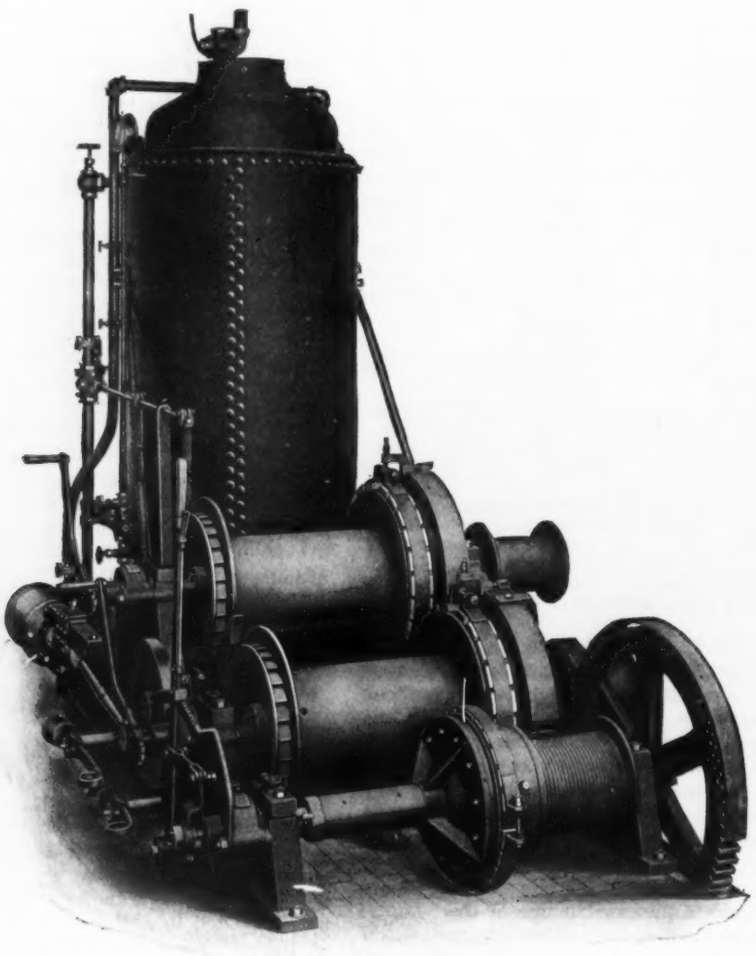
A car for use on an electric railway is being constructed at Elizabethport, N. J., which is to be driven at 150 miles per hour, or intended to be. This car is for the Aurora, Elgin & Chicago Railway, and it is to be hoped that the road itself is capable of standing the racket of such a speed, for this was the difficulty encountered upon the Berlin-Zossen Railroad in Germany, where the same velocity was attempted. At 100 miles per hour, although the road had been carefully graded and ballasted in anticipation of trouble, the oscillations of the car were very violent; but when driven to 120 miles per hour the experiment was stopped as being too dangerous to continue. It is easy to see that this should be the case at such high speeds, for the slightest inequality in the bed of the road acts as an obstacle to lift the car more or less and produce a severe shock. Unless railroads can be made and maintained as smooth and level as a billiard table high speeds, up to and exceeding 100 miles an hour, will not be possible for some time to come.

Niagara Falls has had its share of labor troubles, and as it is a growing industrial center it is interesting to mention that the manufacturers have banded together in an association for mutual protection from employees and others who seek to accomplish a lawful purpose by unlawful means. The new Niagara organization is significant of the disposition of manufacturers to protect themselves, and to make every effort to adjust by fair means and methods disputes which may arise between them and the hands they employ. The organization has been named the Employers' Association of Niagara Falls, N. Y. The officers are: Arthur C. Hastings, manager of the Cliff Paper Mill, president; S. P. Franchot, manager of the National Electrolytic Company, vice-president; Clarence L. Collins, treasurer. A secretary is yet to be named.

The New Lidgerwood Derrick Engine.

An important feature in the derrick engine built by the Lidgerwood Mfg. Company of 96 Liberty street, New York, is the new form of reversible boom swinging gear with which the engine is equipped. This is used in connection with a bull wheel, which should be of a diameter not less than one-fifth the length of the boom. The rope passes around the bull wheel and from that to the drum, one end of the rope being made fast to the drum on one side while enough of the other part of the rope to give the required amount of movement to the bull wheel is wound on the drum and the end attached to the other side of the drum. As the drum revolves one rope winds on as the other unwinds. Only one lever is required to operate the swinging drum. When the lever is in the center of the quadrant the drum is entirely loose on the shaft, and as it is moved either forward or back is driven in either direction. A friction cone of standard type with screw pin, cross key and collar is used for turning the drum in one direction, and a differential band brake (which encircles the flange), when applied causes an internal set of gears to turn the drum in the opposite direction. This cone friction and brake are of the same type as used on the regular drum of the engine, and form an efficient method of gradually checking the motion of the boom when required.

The large gear which drives the swinging drum shaft connects with a pinion which is cast on the inner end of the forward winch head. The ratio of the two gear wheels is such that the swinging drum turns at only one-fifth of the speed of the other drum, which slow speed admits of hoisting the load and swinging the boom simultaneously. This is effected by the operating lever, which has a thumb latch connecting with the latch quadrant so that the lever may be left in any desired position without further attention from the operator until ready to check the swinging of the boom. This swinging gear is adapted to all sizes of Lidgerwood engines from 8 to 50 horse-power. When furnished with a new engine the bed plate can be extended to receive the drum shaft bearings of the swinging gear making the outfit complete and self contained. In applying it to an old engine it is only necessary to remove the winch head from the lower drum shaft and replace it with the winch head furnished with the swinging gear and then bolt the attachment to the same skids that carry the engine.



THE NEW LIDGERWOOD DERRICK ENGINE.

A queer piece of information is cabled from abroad to the effect that the English Government has made some experiments to determine the effect of storing coal under water for a length of time and finds that it is greatly improved, being in fact better than new coal just dug. As the calorific value of coal depends upon the amount of carbon, hydrogen and oxygen it holds occluded, and that it loses rapidly in weight with age, it seems curious that it should absorb the aforesaid gases from water. One effect of storing coal under water for any length of time is that it clinkers badly when burned in a furnace under a boiler.

It is said that difficulties with the third rail system in electrical railways caused by ice and snow in winter have been removed by a solution of brine stored in a tank on the front platform of a car, and fed to the rail by a small rubber tube 5 or 10 feet in advance of the first contact shoe, acting so quickly that the first shoe gets the benefit of it. Eight gallons of brine suffices for a run of 24 miles. This seems to be available for surface electric railways, but upon elevated roads there would seem to be objections from the dripping brine.

The Development of the Telpherage System.

There is scarcely a manufacturer or merchant who is not more or less deeply concerned in the subject of transportation, which, in its widest scope, includes not only the transfer of freight from different sections of the country by the common carriers, but the cartage of goods to and from railroad cars, steamship docks, factories and stores and the distribution of merchandise throughout a city. The recent strikes of freight handlers and teamsters, made particularly onerous by the arbitrary methods of labor unions, have brought the subject of transportation prominently forward and given to the quest for a solution of the problems it presents an importance and significance never before attained, creating a demand for new methods in the handling of merchandise. As a result new ideas are being developed by ingenious minds.

Recently various new mechanical devices of more or less utility have been perfected for the economical handling of fuel, iron ore and other materials at large furnace plants, and similar mechanisms have been adopted by a few railroads and mining companies. Some modifications of this system of engineering have been applied to the economical handling of merchandise at mills and factories, but the system has yet to be developed and applied to the distribution of merchandise in cities. We are informed, however, that competent engineering ability has been addressed to the solving of this problem in the city of Chicago, the solution of which means eventually to place manufacturers, merchants and transportation companies in an eminent degree independent of teamsters, longshoremen and freight handlers.

There is reason to believe that development is being made along the line of the telpherage system, which system is little more than a combination of the features of the electric trolley and the electric traveling crane, and is capable of wide application and of independent modification, being adaptable to almost endless conditions and requirements. It is equally effective in buildings or in the open. The essential features are a single steel rail or cable, with its supporting devices, and the telpher or locomotive, which is pendent from the rail. In the various operations of picking up, carrying and distributing, loading and dumping, provision is made to carry the operator with the telpher, or, if desired, the telpher can be automatically worked from either or both ends of the service. The rail, with its trolley wire, may run at various grades, taking advantage of gravity, or on a level. The telpher is capable of being operated, of course, either above or under ground, but most of the installations thus far have been at an altitude of from 50 to 100 feet. Various devices, of course, are used for supporting the rail, according to the conditions imposed by the location of the service.

In speaking upon the "Economy and Convenience of Telpherage Transportation" before the New England Cotton Manufacturers' Association, Clarence J. Messer said: "Over buildings, around corners, across rivers, sometimes bracketed to the sides of buildings, at others supported in the open land on A-bents, switched onto branch lines via track switches, which the telpher man himself operates, opening and closing doors, running the entire length of the storehouse and picking up a load without a particle of previous preparation—such is telpherage. In or out, handling is the same to telpherage, whether the distance be 50 or 1000 feet, whether the haul is back and forth between different departments, or over the full length of the line, and in either work the effect on mill economics is the same. Cost is decreased." He further asserts that the telpher man can convey 250 tons of freight per day over a distance of 1000 feet. It is claimed that the cost of transferring material by teams around a plant often reaches as high as 40 cents per ton, while by the use of telpherage the cost can be reduced to 5 to 8 cents per ton, which means a saving in many cases in one year sufficient to defray the entire cost of installing a telpherage plant.

It is readily seen that the essential idea of the telpherage system is to bring the carrying apparatus to the load instead of the load to the carrying apparatus. A telpher is, indeed, a mechanically intelligent, automatic teamster that will never go on a strike, and insures the economical handling of freight. The feasibility and flexibility of such a system controlled by electricity are apparent even to a novice, and the system appeals to experienced business men as an avenue to escape from present unsatisfactory conditions in the loading and unloading of cars, and is a likely agent to solve the problem of the municipal distribution of goods.

In railway service, by means of the telpher it is possible to receive a load at the car door and discharge it in the freight warehouse. Freight can also be taken from the center of a box car and, with the system more fully developed, it would be possible, were cars constructed with removable tops, to load and unload through the top throughout the entire length of the car. With the adoption of the telpherage system, of course, cars would be constructed to meet the requirements.

By the adoption of this system railroads would be able to develop more fully that branch of the operating service which seeks to handle freight trains on schedule time. It is recalled that some railroads are already advertising the handling of freight shipments between termini on schedule time as a feature of their operation, and there can be little doubt but that this improvement in railway service will be emulated by competing lines. To facilitate a more general adoption of the schedule time system, the telpherage system is commended to railroad companies. Indeed, the adoption of the telpherage system to its full extent would seem to offer a solution of the problem of demurrage, so irritating to railroads and shippers alike, and would make the rolling stock of transportation companies productive to a high degree.

The Chicago idea is to adopt a modification of the telpherage system which will facilitate the transfer of freight to and from railroads and steamships and the distribution of merchandise throughout the business section of the city, thereby eliminating the teamster and the freight handler as an important factor in transportation.

Foundry Management.*

BY DAVID SPENCE, CHICAGO, ILL.

If a foundry foreman desires to keep his shop force up to a high state of efficiency he will, as soon as he receives an order for castings, see that the necessary cores are at once ordered from the core department. Then he will proceed to learn if he has a suitable flask for the casting, and if he has, he will ascertain if any repair work is needed on this, and if so he will have this done before the flask is taken to the molders' floor. All repairing of flasks should be done by a flask man instead of the molder and his helper. In order that the molder may use his time to the best advantage his helper should see that he not only has facing sand, gaggers' clamps, &c., but he should also look after the many little things which the molder sometimes spends his high priced time in looking up. Even in specialty shops I have seen molders take a hand in barring up flasks. This they should not have to do, as this kind of labor belongs to the flask maker, and the latter will do a better job than the molder every time.

In a great many foundries the men depend too much upon the foreman for everything. They should remember that he is only human, and has not the time to attend to every little detail. It has always seemed strange to me, too, that the place where castings are made should receive so little attention from the owners of plants, a majority of whom seem to believe that anything can be made to do for this department. Perhaps nearly every practical foreman is familiar with shops where ordinary equipment is so scarce that the molders are spending a great part of their time looking for things of which each should have a plentiful supply. The successful foundry manager of to-day must not only be a practical molder, but also experienced in cupola practice or he is not fully qualified for the position. Of course, he should be a man of good judgment, cool and pleasant, and while he should treat his men in a liberal way, he should not be

* Paper read before the American Foundrymen's Association, Milwaukee, Wis., June 9 to 11, 1903.

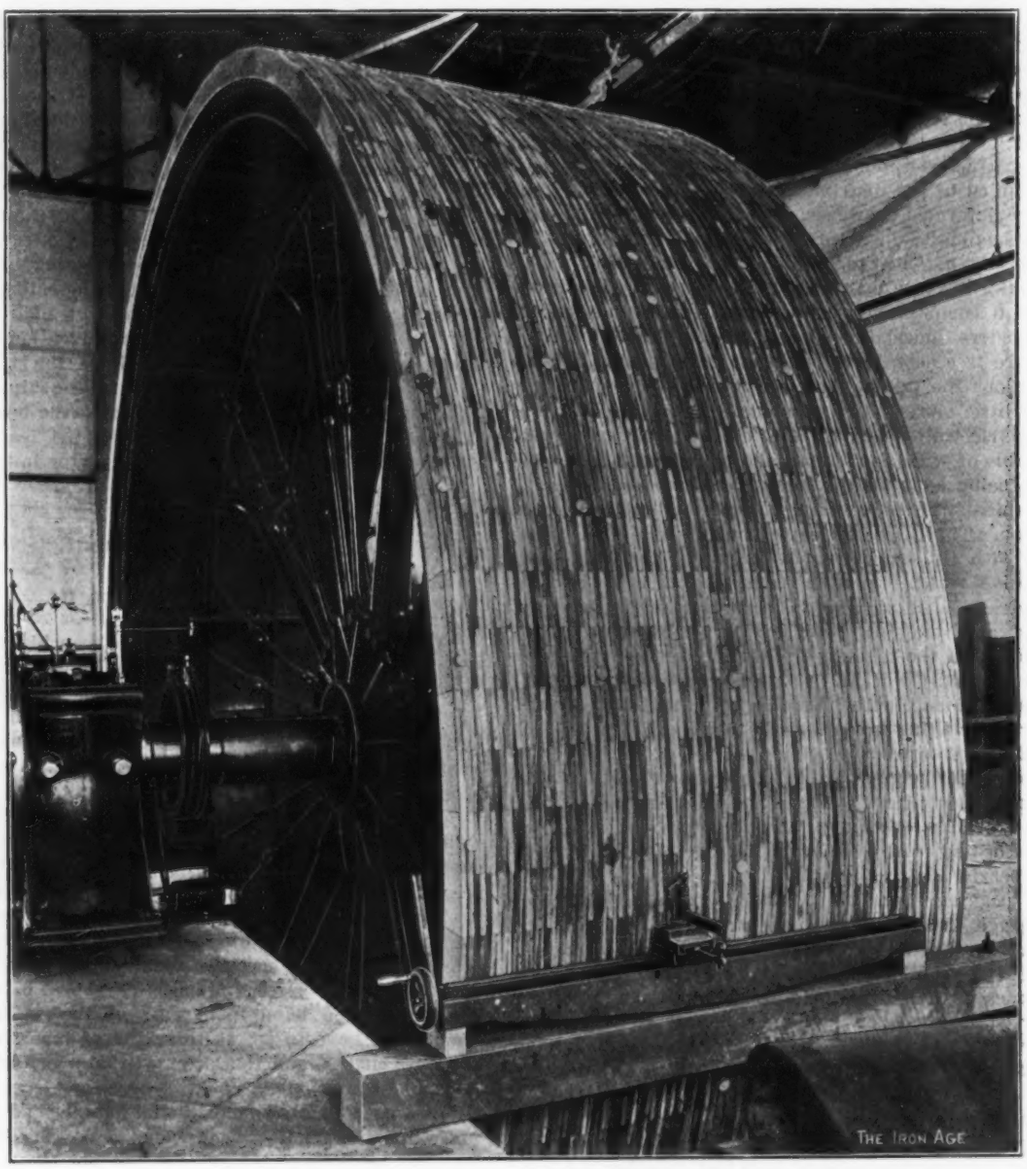
backward about taking a firm position whenever this becomes necessary.

A competent foundry manager is worth a good salary, and is sadly needed by many foundries who are attempting to direct shop affairs from the office through men of small experience who are really not foremen at all. At the present time we have another drawback in our foundries in the form of incompetent pattern making. I have seen patterns come into a foundry made solid, where they should be split, and blank gears with hubs nailed on where these should be left loose. Again the foundry manager has his hands full to handle the traveling class of molders who generally come into a shop without a tool and whenever they are ready to draw a pattern they will look around for a nail to drive into it, and then break a clamp in two so that they may have a substitute for a hammer.

Naturally the successful foundry manager will watch the little things and guard against waste as much as possible. A few years ago I took hold of a foundry where I found 30 tons of iron in the form of scrap buried in the ground. I at once had this dug up and dried and put through the rattler, when I used a few hundred pounds a day until it was all used up. Whenever owners of a foundry have a good foreman they should treat him right and give him to understand that they have confidence in him. When they furnish him what he requires to work with in the way of material and equipment then, and not until then, have they got a right to look to him for results. There are to-day too many men acting in the capacity of superintendents of plants who should be flask men, and I have seen many a foreman who was more competent to be superintendent than the one who was placed over him. The young men of ability should be encouraged and promoted in every way, as it is to them we must look for foundry managers in the future.

Changing a 55-Ton Four-Crown to a Single Crown Pulley.

The improvements made this year at the Dyer Dam Power House, Danielson, Conn., by the Sanderson & Porter Company of New York, made necessary the altering of the size and shape of the engine fly wheel. This wheel was originally built by the Watts-Campbell Engine Works of Newark, N. J., and weighs 110,000 pounds; diameter, 25 feet; width of face, 7 feet 6 inches. The face was turned to four equal crowns, driving four belted generators. It was desired to turn the face to one crown, to drive one generator with a belt 84 inches wide. The thickness of metal in the rim was insufficient to turn off the four crowns to one crown. Patterson, Gottfried & Hunter, Ltd., of New York, selling agents for the Reeves Pulley Company, undertook to build a wood pulley on the iron engine wheel, which had four crowns, and to



CHANGING A 55-TON FOUR-CROWN TO A SINGLE CROWN PULLEY.

turn off the face to one crown. The work was intrusted to them by the Sanderson & Porter Company, and was successfully completed during April.

The drawings, Figs. 2 and 3, show the rim before and after changing. The half tone shows how the sections were applied, staggered in the direction of travel, shaped to the peripheral curve of the iron wheel on the contact side and turned to one crown in the power house.

The wood used was selected sweet gum, kiln dried. The segments were made 16 inches long, 6 inches wide, 13-16 inch thick, and were fitted to the wheel on edge. Five rows of holes were drilled around the wheel. A backbone of six segments was built up and secured by carriage bolts to the central row of holes, and from this

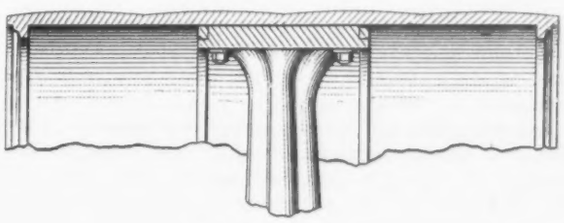


Fig. 2.—Four-Crown.

backbone on each side the segments were fitted piece by piece, glued, nailed and bolted to the rim in two equally spaced rows on each side of the backbone. The carriage bolts were sunk in the segments, glued dowels filling the bore. The whole surface was turned to one crown with a special tool, shown in the engraving, was sandpapered to a finish and shellac well rubbed in, giving a perfectly smooth belt contact. The added diameter, finished, was

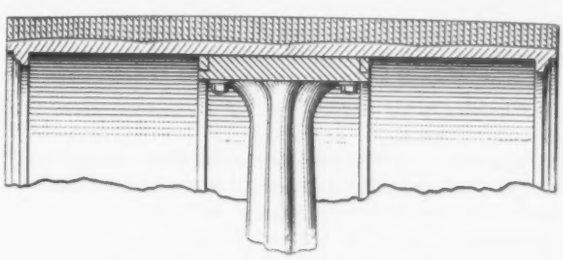


Fig. 3.—Single Crown.

CHANGING A 55-TON FOUR-CROWN TO A SINGLE CROWN PULLEY.

11 inches at the crown, making the total diameter 25 feet 11 inches. The method of lagging employed added to the strength of the wheel, which is now in successful operation.

The New Lukens Plate Mill.—Last week the Lukens Iron & Steel Company of Coatesville, Pa., successfully started the new 140-inch plate mill, rolling about 50 tons of plates during the first half day after test from one furnace. The latter constitutes a novelty in steel plate practice. It is a continuous furnace, 50 feet long and 9 feet wide inside, and will easily heat 200 tons per day of 24 hours. There are three of these furnaces and two four-hole pit furnaces. There was no hitch of any kind in the starting of the mill, except that one pump being stiff sheared a key off.

The Mansfield Glass Works have been incorporated at Lockport, N. Y., with a capital stock of $500,000, and have taken over and will operate the plant of the Lockport Glass Works. Mechanical glass blowers perfected by A. J. Mansfield, the president of the new company, will be installed, more than doubling the capacity of the old works. W. H. Clarke, S. J. Clark and C. V. Schoonmaker of New York City are among the directors, the other directors and officers being Lockport men.

Philadelphia Foundrymen's Association.

The regular one hundred and twenty-ninth meeting of the Philadelphia Foundrymen's Association was held at the Manufacturers' Club in that city, Wednesday evening, June 3. The president, Thomas Devlin, called the meeting to order at the usual hour. The treasurer's report showed a balance of $1977.86 on hand, with all indebtedness paid.

The following who had been favorably acted on in committee were then elected to membership in the association: The Bethlehem Steel Company, South Bethlehem, Pa.; the Camden Foundry Company, iron founders, Camden, N. J.; the American Glutrose Company, manufacturers of core compounds; J. S. Robinson, manager, 12 George street, Camden, N. J.; the Bateman Mfg. Company, manufacturers of agricultural implements, Grenloch, N. J.; the Standard Scale & Supply Company, Pittsburgh, Pa.; representative, H. L. Tripple, 35 South Fourth street, Philadelphia, Pa., and the Bernstein Mfg. Company, Third and Westmoreland streets, Philadelphia, Pa.

Prof. Joseph A. Holmes, chief of the Department of Mines and Metallurgy, Louisiana Purchase Exhibition, addressed the meeting on the subject of establishing at that exhibition, a working foundry plant, for which space, &c., would be donated by the Exhibition Company. The establishment of such a working exhibition has been taken up favorably by the lead, zinc, copper and other metal and industrial interests, and it was deemed quite possible that some such exhibition could be made of the foundry trade, which would be instructive for the practical working of many styles of foundry equipment, &c., and bring out new points of interest in the general foundry practice. In discussing this matter it was the opinion that if the co-operation of the National Foundrymen's Asosciation with the American and Philadelphia Association could be effected the plan would be worthy of undertaking. With this end in view a motion was passed that a committee be appointed by the chair to take such action as would be considered best and to bring the matter before and co-operate with the National and American Foundrymen's associations. The following committee was appointed later by the president: A. E. Outerbridge, chairman; Dr. E. E. Brown, George C. Davis and the president and secretary, *ex-officio*.

The paper before the meeting for the evening was on the subject, "Heating and Ventilating, Especially Designed for Foundries," by Wesley Bartine, representing the Buffalo Forge Company, Buffalo, N. Y., at Philadelphia, in connection with which a number of lantern slides were shown. A vote of thanks was tendered Mr. Bartine for his interesting paper, after which the association adjourned for the usual summer recess. The next regular meeting will be held on September 3.

The Michigan Central Traction Company will build a double track electric line from Lansing to Battle Creek, a distance of 57 miles, passing through the cities of Lansing, Grand Ledge, Charlotte, Bellevue, Olivet and Battle Creek. Construction is expected to be well under way by August 1. With the exception of a 1000-foot trestle over the Thornapple River, all grading will be easy. The roadbed is to be well ballasted and 75-pound rails will be used. An average speed of 30 miles an hour is expected to be maintained between Lansing and Battle Creek. The company are capitalized at $1,300,000, all of the stock being held by S. W. McCall of Boston.

The Barrow-in-Furness meeting of the Iron and Steel Institute will be held on September 1, 2, 3 and 4. The programme will embrace visits, among others, to the works of the Barrow Hematite Steel Company, Limited, and the British Chilled Iron & Steel Company; to the shipbuilding yards of Vickers, Sons & Maxim, Limited; to the works and docks of the Furness Railway Company, and to the iron ore mines at Hodbarrow; to Kennedy Brothers' mines, and to the Millom & Askam Iron Company's works. Excursions will also be arranged to the lake district and to Blackpool.

Notes from Mexico.

As to Silver.

DURANGO, June 1, 1903.—Following the advance in the price of bullion a few weeks ago, consequent upon the purchases of silver for the Philippine coinage scheme and other foreign demands, the appreciation of the Mexican dollar, which was quickly visible, has been maintained, with exchange fluctuations confined to narrow limits. The national monetary commission is still accumulating data. Business men are eagerly watching the movements of Secretary Limantour, whose reported declaration that the work in which he is engaged, of giving the country a stable dollar, will be crowned with success, has been received with great satisfaction.

New and improved machines, costing $50,000, have been ordered for the mint in the capital, which is now turning out some $2,000,000 per month. The director of this institution predicts a large increase in silver production this year as compared with that of last year.

The Presidential Succession.

There has been a great deal of discussion during the past year with reference to the personality of the next President. Two or three distinguished public men have been named as heirs presumptive to the political fortunes of President Diaz, who has been credited with a desire to retire to private life, if not during his present term of office, at least upon its expiration. It may be taken as a settled fact that President Diaz will be elected for another term, and that all these predictions are wide of the mark. In an address to his supporters a few days ago the President said: "It is a fact, as you are well aware, that I gave to my country my earliest years. That fact is a guarantee to the national convention that I would never commit the gross impropriety of withholding from my country my last years—the years which I never thought to attain when I first consecrated my life to the fatherland."

Tax on Explosives.

A bill was recently introduced into the Chamber of Deputies modifying the law in relation to the tax on dynamite and industrial explosives. The text of the measure is as follows:

Article 1. Authorization is given to the Executive to the end that, in accordance with the contract entered into between the Department of Fomento and the National Dynamite & Explosives Company, it may establish an interior consumption tax on dynamite and industrial explosives imported from abroad or manufactured in the republic, which tax shall be payable when and as the Executive may decide.

Art. 2. The basis for the establishment of this tax shall be as follows:

1. Dynamite and industrial explosives entered through the customs houses of the republic or manufactured in the territory of same shall be taxed at the rate of $210 per metric ton, gross weight.

2. Exemption from this tax may be allowed to common black gunpowder, for mines, fireworks or sporting purposes, in the composition of which the only ingredients are sulphur, carbon and nitrates of soda and potash, provided there be in it no nitro-glycerine, chlorate of potash or other explosive.

3. The Mexican National Dynamite & Explosives Company will pay the interior consumption tax on the products that they may manufacture in the form and subject to the conditions that are set forth in the contract into which they entered with the Department of Fomento on August 12, 1901.

Industrial Notes.

An industrial publication of the capital thus comments upon the demand for United States manufactured tools: "There is a large and growing demand in Mexico for all kinds of machine tools of the most improved design. As is everywhere the case, American tools are preferred. American machinery has always commanded the best line of orders in this country. . . . American machinery and machine tools soon supersede all others. Some of the most important manufacturers of edge tools, realizing the field which Mexico presents for the introduction of this class of machinery, made arrangements years ago for the sale of tools in this country. As a result their goods are displacing those from Germany. The introduction of these lines has not, however, proceeded as rapidly as other classes of machinery, due to the fact that the tool manufacturer has been too busy or has not seen the necessity for supplying his agents with printed matter in the Spanish language."

Increased shipments of plows of United States manufacture are reported by the railways, which may be accepted as evidence that improved methods of agriculture are slowly but surely being inaugurated.

The General Hospital of the capital has contracted with the Acme Water Storage & Construction Company of Huntington, L. I., for the installation of a plant at the institution named.

Electric street car systems are about to be introduced in the cities of San Luis Potosi, Merida and Guadalajara. Orders for equipment have already been placed for the city last named.

The Velardeña Mining & Smelting Company of Velardeña, Durango, have ordered from the Loomis-Pettibone Gas Mfg. Company of New York a 2000 horse-power gas engine plant for their mines.

Labor troubles are reported among the imported glass blowers at the Monterey glass works. The workmen demand an increase of wages, which has been refused. The men are now out on strike and the owners of the factory are investigating Mexican law in its application to the situation.

An industrial combine—the initial venture of the kind in the republic, aside from railway consolidations—may soon be evolved. For a long time past negotiations have been in progress to consolidate the principal cigarette factories. These negotiations have reached a stage which presages a successful outcome. The new concern are known as the National Tobacco Corporation, representing some $4,000,000 capital, Mexican currency. The corporation will control the three leading cigarette manufacturing plants of the country.

An ice making plant is to be established in Mondova, Coahuila. Señor Cecilio Paez of the town named, who has the enterprise in hand, is about to place orders for the necessary machinery.

W. J. Alexander has obtained a concession from the Government for the construction of stockyards and a cattle market in the Federal District. The yards, buildings and auxiliary offices are to be commodious and extensive. At least $300,000 capital is to be invested in the enterprise within the term of five years.

The folowing item is from the *Mexican Herald:* "According to the report submitted at the meeting of shareholders of the Monterey Iron & Steel Foundry, held May 3 at Monterey, the result of the company's operations in 1901 was $42,267.30 net profit; and in 1902 the net profit was $271,771.83, making a total net profit of $314,039.13 in the two years." During the time indicated the works have only been in partial operation.

A chamber of commerce dealing especially with expanding trade between Mexico and Great Britain is about to be formed in Liverpool. The Mexican consul at that seaport is active in establishing the institution.

The rate of exchange for the current month, to be used in the liquidation of import duties, has been fixed at 228.80 per cent. J. J. D.

Blacksmiths' Local Union No. 14, with nearly 600 members, has been suspended, through the action of President Slocum and P. H. Cummins of the national body, for having broken its agreement with the Chicago Metal Trades Association in joining the blacksmiths' helpers, who broke their agreement with the Metal Trades Association and struck on May 18. An attempt to persuade the union to go back to work ended in failure, the men voting to remain on strike in sympathy with the helpers. Upon the withdrawal of their charter, however, a committee of three from the suspended union and the business agent of the helpers' union waited upon the secretary of the Metal Trades Association in an endeavor to secure permission for the helpers to resume work under the broken agreement. Their request was denied on the ground that their organization had been suspended and the employers would not deal with them locally.

Malleable Cast Iron *

BY DR. RICHARD MOLDENKE, NEW YORK.

Whatever may be the scientific definition of a malleable casting for commercial purposes, it is one made of iron of special composition and rendered malleable by subsequent annealing. The composition of the hard casting lies between well defined limits, and it is affected by so many conditions that the successful production of this class of work is one of the most difficult branches of the iron industry.

Characteristics of Carbon in Malleable Castings.

While nominally the composition of a good malleable casting is but little different from that of a car wheel or a roll, yet the fact that it can be twisted, bent and hammered out hot or cold and has double the tensile strength of these products shows that the constitutions of the castings are quite different. This difference in the constitution may be traced to the condition of the carbon in each. In the ordinary gray casting we may have some 3 to 3½ per cent. graphite present. In the malleable casting we have the same amount, weighed as graphite in the analysis, but radically different in its characteristics. This form of carbon due to the annealing process has been called temper carbon by Professor Ledebur, who first described it in connection with the malleable (Ger. "temper") process. I will mention one of the peculiarities of this form of carbon. If a malleable casting which on fracture shows the fine black velvet surface is heated up very high and then plunged, all this amorphous carbon is dissolved, and the fracture shows the grain of a good tool steel. The same is often seen when a piece is hammered cold, and more especially when a casting that has become warped is heated up and straightened. The grain in the latter instances will not be as good as in the first one, but it shows that to straighten a malleable casting no heat, and preferably pressure only, should be applied. This characteristic of the carbon is often used to palm off malleable castings as steel ones, much to the disgust of the user and the producer of bona fide "malleable."

Properties and Tests.

Of the properties of the malleable casting, it may be said in general that the tensile strength should run between 42,000 and 47,000 pounds per square inch. Castings showing only 35,000 pounds are still quite serviceable for ordinary work. It is not advisable to run much beyond 54,000 pounds per square inch, for the resilience is reduced, and one of the most valuable properties of the malleable casting impaired. I have made much work running up to 63,000 pounds, by the plentiful addition of steel to the mixture in the open hearth furnace. I do not, however, recommend this, as wherever such high results are wanted they can best be obtained by using the steel casting direct.

As an instance of what can be done with malleable castings I will mention a series of tests made with bars of small and large diameters, which were heated and carefully drawn out under the hammer. While the interior or high carbon portion was badly cracked up, the surface was of such a fine material that in one sample the tensile strength actually ran up to 123,000 pounds per square inch.

The elongation of a piece of good "malleable" will lie between 2½ and 5½ per cent. measured between points 2 inches apart. The thicker the piece the smaller the elongation. In making the tranverse test, the deflection of an inch square piece, resting upon supports 12 inches apart, should be over ½ inch, the breaking weight being at least 3500 pounds. Very soft iron often deflects 2½ inches under this test, but this is exceptional and may not be reproduced continuously.

The high resilience, or resistance to shock, in "malleable" is its most useful characteristic. It is well known in railroad circles that the ordinary steel casting comes nowhere near the malleable for service conditions. Only where an exceedingly high tensile strength is required, as in the car couplers for the heavy modern trains, is the malleable casting being gradually replaced. On the other hand, car castings formerly made of gray iron are now specified for malleable wherever possible, in the interest of greater strength and reduced weight. When we remember that the present production of malleable castings is at the rate of 650,000 tons per annum, and at least half of this goes into car construction, the importance of the industry may be properly gauged.

In spite of this enormous production, there is really little information available outside of the foundries most interested, and it may as well be said, also very little within. The founder is not going to increase the difficulties in his sales if he can help it, and the inspecting engineer, not being able to check the process from his own understanding, cannot act as intelligently as he really should. The American Society for Testing Materials is, however, at present at work on this very thing, and we shall soon have a set of specifications governing the production of these castings where good qualities are essential, which will insure better work all along the line.

The Structure of Malleable Iron.

Before going into the composition of good "malleable" it is necessary to look a little into its structure. Originally cast to be perfectly chilled—that is, with the carbon all combined—and a contraction of some 1¼ inches to the foot, the annealing process serves to expel the carbon from its state of combination, depositing it between the crystals of the iron, not in the crystalline graphite of the gray iron, but as an amorphous form not unlike lampblack. At the same time an expansion equal to half of the original contraction takes place, the net result being a shrinkage allowance for the pattern identical with that for gray iron castings of similar shape and thickness.

Besides this expulsion of the carbon from its combination, there is a removal of some of it from the outer portions of the casting. This amounts to nearly all in the skin to nothing ¼ inch inward. I do not take kindly to the generally accepted theory that oxygen from the packing penetrates the casting, removing the carbon by burning it out. I have always found that when oxygen has access to the interior, through the open structure of the iron itself, this is also oxidized with the carbon, and the whole presents a sorry sight. Whether, however, carbon diffuses out or not in a good casting I cannot say, and hope that this point will some day be taken up and settled by careful experiment.

It will be noted that owing to the removal of varying amounts of carbon from the skin to the interior no carbon determination of a malleable casting is of any value, unless the sample is taken before the anneal, and even then it is only good for the total carbon. For an annealed piece a sample taken from the center of the fracture with at least ⅜ inch untouched around the drill would give a fair indication of the carbon contents, but cannot claim accuracy.

Chemical Constituents.

In former days of charcoal iron about 4 per cent. carbon was the rule in malleable castings. In these days of coke irons and steel additions to reduce the carbon this may run as low as 2.75 per cent. before trouble ensues in the anneal, if not already in the foundry through excessive cracking and shrinkages. With the modern demand for a high tensile strength it is well to place the lowest limit at 2.75 per cent. and the upper limit for common work would be found in the saturation point of this grade of iron, or 4.25 per cent. It is absolutely necessary that the hard casting be free from graphite; even a small amount of this indicates an open structure with consequent ruin to the work in the anneal from penetrating oxygen. To keep the carbon in the combined state is the function of the silicon percentage arranged for in the mixture, the rate of cooling due to the cross section, the pouring temperature, sand, &c.

The sulphur content is quite important, especially just now when we are getting the sweeping of the coal mines for our fuel to a greater or less extent. The percentage should not be allowed to go over 0.05, though double this

* Paper read before the American Foundrymen's Association, Milwaukee, Wis., June 9 to 11, 1903.

may let a casting pass muster where good work is of no special object. Once the sulphur exceed 0.05 trouble may be expected. It is therefore wise to hold the pig irons below 0.04, and to see that the fuel used is not too rich in sulphur.

Manganese is seldom troublesome, as it does not often exceed 0.40 in the mixture, which means 0.10 to 0.20 in the casting. Above 0.40 in the casting it begins to give trouble in the anneal, and therefore manganese as a general proposition should be kept low.

Phosphorus should not exceed 0.225, and is better kept below this.

To get the proper silicon limit for the class of castings you have to make is the trick which means either success or failure for your foundry. This will be realized from the fact that you do not know how your castings will come out until about a week after they went into the anneal. Now suppose your mixture is wrong, and the silicon is either too high, which means "low" or rotten work, or too low in the castings, making them high (strangely contradictory but nevertheless shop terms in daily use and dating back to the times when silicon was unheard of in malleable works). This means hard, burnt white castings, stronger than the first mentioned class, but equally undesirable. You will not know of this until a whole week's work, in all probability equally bad, has been placed into the ovens, and comes out in its turn only to wander into the scrap pile. Naturally disaster stares the inexperienced founder of malleable castings in the face all the time, and only a good laboratory will keep him out of hot water, everything else being equal. It also shows the necessity for better protection to the buyer, who cannot be supposed to distinguish between a good and an only fair casting.

In general we may say that the thicker the casting the lower the silicon allowable in order to get a white iron in the sand. Thus for the heaviest class of work the silicon of the casting should not exceed 0.45. For ordinary work 0.65 is the point to be sought for. Agricultural work may run up to 0.80, while the lightest casting may have 1.25 per cent. without danger, though it is not advisable to exceed this limit for anything.

Our American practice differs from the European in several respects. We have a comparatively short anneal —that is, we aim at a conversion of the carbon rather than its removal. Over there it is desired to get all carbon out, so that a wrought iron casting, if it may be so called, may result. With much of the iron cast from crucibles it is quite possible to make very fine grades of work, and this may account for higher prices for malleable than steel castings paid in some parts of Europe. Imagine, however, what would result if we had the crucible processes here, with our average production of some 35 tons daily in the larger plants, or some 80 in the very large ones.

The common American practice is to use the reverberatory, or "air," furnace, either with or without the top blast over the bridge to hasten the melting. There is always a blast introduced under the grates, unless indeed in our older works where the chimney draft is exceptionally good.

The Open Hearth Furnace.

About 12 years ago the open hearth furnace was introduced into one of our largest works, and it was my good fortune to gain experience with it there. While not many malleable establishments have the open hearth furnace (I can count them on my fingers), yet it is undoubtedly the most economical melter there is, provided several things. One is that it must be kept busy as much as possible, as only then its full economy is taken advantage of. Then skilled workmen must be kept in charge. This does not mean the steel melter with his habit of letting the heat take care of itself, and tapping a 10-ton heat five hours after charging, whereas it should come out in two hours and a half. But it means a man who will use his muscle freely to rabble up the heat, push the pigs into the bath as quickly as they can be cared for, mix his iron well and fire sharp and quick so that the process becomes one of melting only rather than a refining or burning out of large quantities of silicon and carbon. When these conditions prevail, the open hearth will prove a friend indeed and turn out a most excellent product.

Let us take fair conditions with three heats daily from a 10-ton open hearth furnace. Using producer gas the fuel ratio is about one of coal to six of iron. In the reverberatory furnace the fuel ratio is one to four at best, and often only one to two. It is not advisable to make larger heats than 15 to 18 tons, as the time consumed in melting, and especially in pouring from the small ladles after tapping, becomes so great that the bath is seriously damaged by undue oxidation and overheating. When the time comes for continuous melting in the malleable foundry, when heat after heat is taken off as fast as the bottom can be patched up and the furnace charged again, then will the complete economy of the open hearth furnace be fully realized. We may then also see the tilting furnace of value to us, though a device of my own, which I am using successfully in my own interests, and which allows the tapping from three spouts at different levels, successively, has the advantages of the tilting furnace for "malleable" without incurring the heavy first and running costs.

For making malleable castings, the open hearth furnace should be pushed very hard for a time, almost sufficient to collapse it, then it should be checked before actual damage is done to crown and ports. In this way a short, sharp heat is obtained. The silicon of the heat may be calculated for a loss of 20 to 25 points, whereas from 35 upward is the rule in other processes. Three hundred heats should be taken off before repairs of several days' duration are required, and a total of at least 1000 heats only should necessitate practically a rebuilding with but little loss other than the refractories.

The Air Furnace and the Cupola.

In the meantime there has been much improvement in the air furnace. Strange to say, while the quantity of metal, the composition, excepting only in the phosphorus content, of the large roll and the malleable casting is the same, the air furnace used in each industry has been developed on different lines. In making rolls we find the short high reverberatory chamber, more on the lines of the copper furnaces, while in the malleable industry the furnace is long, very low, and contracted at the stack entrance. While formerly the hearth was practically rebuilt after each heat, at the present day several heats are taken off before a new bottom is made. The bungs, of course, always suffer, and herein the crown of an open hearth is much more easily cared for. But the poor efficiency of the fuel is an inherent difficulty which cannot be overcome, and presents new difficulties with every change of quality.

At the present time there is a general difficulty with the coal used, which means castings with an undue amount of sulphur. These castings are weak and will some day wander into the scrap pile. When the next slump comes we will be confronted with a serious condition. This high sulphur scrap will come into the market —in fact forced upon the founder wherever his castings can be identified. They will be hard to use by him, and from the fact of high sulphur will not be available for basic steel, as was the case formerly. There is then a neat problem, and one which will make the fortune of any one who may discover an economical remedy, and that is the removal of sulphur from iron on a commercial scale. I present this to our experimenters and wish them success with it.

The cupola still turns out a considerable tonnage of malleable castings, but this process will be gradually superseded by the furnace method, chiefly on account of the better grade of work turned out by the latter. There is, however, one interesting point connected with the cupola process, or rather with cupola iron, which we must go into more fully in connection with its bearing upon the anneal. Cupola iron requires some 200 degrees F. more than furnace iron to anneal it properly. This is a general proposition. It seems strange that it should be so, but possibly the structure of cupola iron is so close

that it requires more effort to get the crystals apart and to effect the liberation of the carbon from its state of combination. Whether this is due to the contact of the metal with the fuel as it trickles down in thin streams and drops is hard to say, but the difference certainly exists, and must be provided for in the anneal.

Annealing.

Naturally with a higher degree of heat the wastage of the annealing pots is more marked, and the process becomes more expensive in this regard also, for our annealing boxes must be reckoned as a dead loss, which is to be diluted, as it were, by as long a life as possible in the ovens.

In studying the annealing process we find two extremes leading to about the same results, so far as the carbon change is concerned. A short anneal at a very high heat is as effective as a comparatively long anneal at a much lower temperature. That is to say, we can anneal, or rather change the carbon in a casting, by placing it over night in a melting furnace which has been let cool below the melting point of the iron, or do the same thing in the annealing oven at a much lower temperature, but giving it a week's time. Of the two methods the latter is by far the preferable, as it not only permits the change in the carbon but also gives the carbon time to get out. Then again, the chances of burning the castings in the anneal are obviated. The result is a good, reliable casting, while in the hurry-up processes one never knows whether they are annealed at all. Sometimes they are and often they are not. Malleable founders, therefore, while experimenting for generations on short annealing lines, have come to recognize that the best all around and safe method is to arrange matters so that an oven may be regularly recharged on the same day of the succeeding week.

We may describe the annealing process by a curve which runs up quickly, remains horizontal for a short time and then drops very gradually. That is, a sharp heating up, in the shortest safe time possible, then a shutting off of the dampers and maintaining of the temperature evenly for a period of say two full days at least, and then a gradual cooling down to at least a black heat before dumping. Here is where mistakes are often made, annealing pots being drawn red hot because some particular casting is wanted badly. The castings are red hot when the air touches them, the delicate reaction of the carbon is disturbed and an inferior material results. I have always had softer, more malleable iron from the anneals which had the extra Sunday to become cold in the oven and were cold when dumped on Monday morning.

An oven can be brought up to heat as quickly as may be, the fuel waste to do this being alone considered. In cities where the smoke problem exists more time is required than in the open country. For a fair sized oven at least 36 hours are required to bring it up to heat (a pyrometer should always be used to test this), and then it should be held there.

As to the actual temperatures there is this much to say. Furnace iron of average thickness must have received over 1250 degrees F. after coming up, until cutting off the heat, to be safely annealed. Perhaps even then some of the work must be put back for another anneal. A safer limit is 1350 degrees F., and no more is necessary. This temperature must exist in the coldest part of the furnace, or usually at the lower part of the middle in the front row pots. As a rule the upper space of an oven is some 200 degrees F. higher than this, although I have succeeded in building ovens in which there was but a difference of 100 degrees F. throughout the whole interior space, the temperatures being measured with a Le Chatelier element 20 feet long.

Translating these temperatures, we find that 680 degrees C. is the lowest point for successful annealing of furnace iron, while 780 degrees C. is the safest one. For cupola iron the temperature should be about 850 degrees C.

Benefit of Science to the Foundry Industry.

If we contrast former times with the present in the malleable industry, when charcoal irons only were supposed to chill, when immense piles were kept at the command of some melter who had inherited the art of looking wise over the test plug, where would we have been to-day when the importing of foreign irons is the order of the day? In dollars and cents the benefit of science to the much neglected foundry industry has been incalculable, and perhaps the malleable foundry has received the greatest share, as it needed it most.

I cannot refrain from again calling attention to the fact that only education, and hard work to use this education properly, will allow us to hold the supremacy we have now wrested from industrial Europe. We must place our brightest young men in the technical schools, our apprentices in the evening and trade schools, and our children in manual and training schools. Let those who have the making of future captains of industry be properly trained and they will save many years of mistakes and wasted effort. Let the poor boy who wants to better his prospects in life be given the opportunity to enrich his store of knowledge. He will then see something ahead, and in times of trouble stand by his employer for justice and an unrestricted opportunity to receive full value for any increased output resulting from his skill and ingenuity. The foundry is a good place to study industrial conditions, and our hope for the future of the nation lies in the education of our young men.

German Exports to Southern Russia.—The German Consul at Rostow on the Don, Russia, has sent to his Government a very instructive report from which the following extracts, interesting to American exporters, are made by Simon W. Hanauer, Frankfort-on-the-Main, Germany: "Notwithstanding the strong competition from England and the United States, German trade to South Russia is pushing forward. While the importation of machinery in general has declined, that of agricultural machines and implements has increased. German steam threshing machines succeeded well; 75 of these, ranging from 3900 to 6500 roubles (a rouble equals 51 cents) in price, have been sold. German plows are in good demand. German cutlery and steel small wares have been sold to the value of 2,000,000 marks (a mark equals 24 cents). Enameled tinware of German make is very popular, the sales in this district averaging about 2,000,000 marks per annum." The Consul remarks that these gratifying results are due to the activity and ability of the German commercial travelers who canvass his district with zest and succeed in getting fine orders. Our American manufacturers should emulate the example set by their German *confrères*. Sending out circulars printed in the English language won't fetch orders, while other countries send out smart, hustling salesmen.

An English correspondent sends us the following: "We are much interested in reading your article on French tool steel makers, page 28 of your issue for May 14, as we did not expect that such people would flourish in your country. We understood that the American equivalent of this trade was done in oil. We have been pestered with these foreign travelers for some years past, and our object in writing to you is to enable you to caution your readers at the present time not so much against French representatives (as their game must be about blown by now), but against travelers from countries further afield. We have had them during the last few days from Siberia and Brazil. When the traveler of a foreign maker called here he made the remarkable statement that the material he sold weighed 30 to 40 per cent. less than ordinary steels after it had gone through their particular preparatory process."

On June 1 John N. Reese of Harrisburg, assistant superintendent of blast furnaces for the Pennsylvania Steel Company, at Steelton, Pa., was made superintendent, vice Otto C. Burkhart, resigned, and James H. Gledhill was made assistant superintendent.

Notes from Great Britain.

The Market.

LONDON, May 30, 1903.—The only incident of interest this week is the meeting of the Wages Board, and this was not inspiriting. Being the meeting before the holidays, it was hardly expected that there would be any livening up. In no direction was there much doing, but so far as could be observed the tendency was slightly weaker in some sections. Pig iron, for instance, was not regarded as quite so firm as it was a week ago, and though nominally quotations were unaltered, sellers would have been a little easier to squeeze had consumers been at all anxious to come onto the market. They are, however, disposed to wait until after the Whitsuntide holidays. In almost every branch of finished iron business was very quiet. Black sheets were, in fact, weaker to the extent of ½ crown, but on the other hand some galvanizers continue to quote £11 10s., f.o.b. Liverpool. In steel the freedom from German competition is apparently to be short lived, inasmuch as German sheet bars are being offered for delivery in the final quarter of the year at £4 13s. With British steel at £4 15s. there is, however, very little inducement to buy so far ahead at such a price. Prices this week are: Scotch pig, 52 shillings 4½ pence; Middlesbrough, 45 shillings 7½ pence; hematite (W. C.), 57 shillings 6 pence. Forge qualities: Staffordshire cinder, 49 to 50 shillings; part mine, 50 to 51 shillings; all mine, 57 shillings 6 pence to 67 shillings 6 pence; best ditto, 80 to 85 shillings; cold blast, 95 to 100 shillings; Northamptonshire, 48 to 50 shillings; Derbyshire, 50 shillings 6 pence to 51 shillings 1 penny; North Staffordshire, 51 to 52 shillings; Lincolnshire, 53 shillings 1 penny.

Finished Iron.—Marked bars, £8 10s.; Earl of Dudley's brand, £9 2s. 6d.; second grade, £7 10s.; common unmarked bars, £6 5s. to £6 10s.; North Staffordshire bars, £6 15s.; angles, £6 15s. to £7; sheets, singles, £7 2s. 6d. to £7 7s. 6d.; doubles, £7 5s. to £7 10s; trebles, £7 17s. 6d. to £8 2s. 6d.; galvanized corrugated sheets, f.o.b. Liverpool, £11 5s. to £11 10s.; hoop iron, £7 5s.; nail rod and rivet iron, £7 5s. to £7 10s.; gas strip, £6 12s. 6d. to £6 16s.

Steel.—Bessemer billets, £4 15s. to £5; Siemens billets, £4 17s. 6d. to £5 2s. 6d.; mild steel bars, £6 12s. 6d. to £7 2s. 6d.; steel plates, £6 5s. to £7; steel girders, £6 to £6 5s.; steel angles, £5 15s. to £6 7s. 6d.

Prospects in South Africa.

The development of South Africa goes on apace, although the pace no doubt is slightly slackened compared with the feverishly active months immediately following the war. One or two hints are worth noting. One is the importance of American engineering firms appointing agents in the leading South African centers to secure Government or other orders. One reason among others is that tenders are often made returnable only a few days after their advertised call. Quite recently the Public Works Department at Capetown advertised for important tenders only eight days before they were returnable, which, of course, wholly excluded from participation all firms not represented on the spot. The particulars of this tender are worth citing to show the diversified character of the machinery and plant required. It included one 4-inch centrifugal pump; one portable compound engine and boiler; two Thornycroft steam wagons; two 5-ton wagons for above; one stone breaker, with portable compound engine and boiler, one portable concrete mixing plant, two hand power derrick cranes, one 5-ton compound steam road roller, one road roller for horse traction; four steel drag scrapers, two steel wheeled scrapers, four sets steel harrows, one overhead cableway installation, one steam excavator. Similarly the Johannesburg Town Council recently advertised for the delivery of 10,000 steel stamped sanitary buckets and 500 lids, information regarding which could not reach American headquarters in time to quote. That further large contracts are under way there can be no doubt. For example, it is the intention of the Natal Government to give instant effect to the recommendations of the engineering experts who have reported on the improvements needed to bring Durban into line with its future trade requirements, as also to perfect its railway system with a similar end. This is shown by the fact that steps are now being taken to raise a loan of £4,000,000 to be expended on the objects above named, as also upon telegraphs and other public works.

What may prove to be an engineering event of the first importance is the electrification of the Victoria Falls on the Zambesi. It is probable that in a few months' time the railway will be up to the Falls, and the survey and preliminary works for a great installation of electric lighting plant will be commenced by the erection of the Concessions, Limited, who are under obligation to the Chartered Company to make an early investigation at a cost of £10,000. The Victoria Falls are double the width and more than twice the hight of the Niagara Falls, as will be seen from the following table:

	Width.	Hight.	Estimated average horse-power.
Niagara Falls	½ mile.	158 to 167 feet.	7,500,000
Victoria Falls	1 mile.	400 to 420 feet.	35,000,000

Calculations go to prove that electrical power can be transmitted over a radius of 400 miles at a profit, and that it would serve 1500 miles of railroads, including the townships of Buluwayo, Salisbury and Gwelo, the copper fields north and south of the Zambesi and the gold fields of Mazoe, Lo Magunda, Hartley, Sebakwe, Morven, Gwelo and others, in addition to the Wankie coal fields. In Rhodesia there are, in fact, a thousand and one purposes to which this energy developed at the Victoria Falls could be applied. In the mining districts electricity would economize labor, haul from deep levels, drive rock drills or propel locomotives. For driving fans alone in the deeper mines electrical energy might do much in reducing the ravages of that terrible scourge, miner's phthisis, which is now the subject of a special commission in Johannesburg.

Electrification seems to be the *mot d'ordre* in South Africa. Sir Percy Girouard foreshadows a new departure in the electrification of the Transvaal railroad system. An initial scheme is to electrify the east and west railroad services for passengers only, coal being obtained for generating purposes alongside the line and a suitable site for the power station being naturally indicated at the colliery. If electric trains are adopted it is possible that the present trains of seven or eight carriages running every hour will be changed into short electric trains with a half hour or 20 minutes' service. The population of this portion of the Rand is increasing at such a rate that the innovation should pay for itself even at low fares.

The Mining Machinery Outlook.

Though the mining machinery industry suffered severely from the effects of the late war in South Africa, a feeling of stability is now beginning to assert itself. This may be seen from the following figures, which show the total exports of mining machinery from this country, as well as the exports of Great Britain to South Africa:

Exports of Mining Machinery.

	Total exports.		Exports to South Africa.		Exports to other countries.	
Year.	Value.	Increase or decrease.	Value.	Increase or decrease.	Value.	Increase or decrease.
	£	£	£	£	£	£
1894..	386,602	−22,903	237,484	+13,291	149,118	−36,194
1895..	716,562	+329,960	487,440	+249,956	229,122	+80,004
1896..	1,048,485	+331,923	589,412	+101,972	459,073	+229,951
1897..	868,831	−179,654	509,555	−79,857	359,276	−99,797
1898..	716,377	−152,454	314,424	−195,131	401,953	+42,677
1899..	730,818	+14,441	349,266	+34,842	381,552	−20,401
1900..	561,557	−169,261	144,817	−204,449	416,740	+35,192
1901..	509,249	−52,308	108,365	−36,452	400,884	−15,856
1902..	549,742	+40,493	221,708	+113,343	328,034	−72,850
1903*.	227,847	+45,270	97,339	+25,181	130,508	+20,089

* Four months.

For the ten months ended April 30, 1903, the corresponding figures are as follows:

Ten months to April 30, 1903..	506,531	+86,560	216,034	+88,120	290,497	−1,560

The business of Fraser & Chalmers, Limited, one of the largest mining machinery manufacturers in this country, suffered pretty severely from the war. This company were, of course, an offspring from the American concern, their formation dating from 1890, with a capital of £675,000. Various changes have been made from time to time,

and at present the issued capital is £479,900. The position of this company is shown by the following table, and it will be seen that, although the shareholders in 1902 received a dividend of 10 per cent., the carry forward is almost sufficient to pay a further dividend of 20 per cent.:

	Year ended June 30, 1902.	June 30, 1901.	June 30, 1900.
Trading profits	£43,355	£47,361	£36,002
Interest, discount, &c.	3,356	4,180	6,585
Interest on bonds in American company	21,549	13,310	15,464
Gross profits	£68,260	£64,851	£58,051
Management expenses, &c.	12,935	12,462	11,559
	£55,325	£52,389	£46,492
Depreciation account	4,975	6,053	6,016
	£50,350	£46,336	£40,476
Debenture interest	3,033	15,000	15,202
	£47,317	£31,336	£25,274
Preference dividend	*6,300	†4,725	†3,291
	£41,017	£26,611	£21,983
Ordinary dividend	*37,800	†25,988	‡
	£3,217	£623	£21,983
Brought forward	§80,771	93,203	108,167
	£83,988	£93,826	£130,150

* 10 per cent. † 7½ per cent.

‡ In consequence of the sale of the American business the company were enabled in May, 1901, to pay a final dividend of 2½ per cent. for the 18 months ended June 30, 1899, and a dividend of 7½ per cent. for the year ended June 30, 1900. This consequently reduced the carry forward to £93,203, instead of the £130,150 here shown. See the amount brought forward for 1901.

§ The amount carried forward at June 30, 1901, was, as shown, £93,826, which was reduced to £80,771 by the deduction of the premium of £13,055 paid on the redemption of the debentures. See the amount brought forward for 1902.

The outlook seems to be very good, and the home trade has given the company a broader basis for their business. The export trade is also favorable, and apparently the company may expect another successful year.

An Engineering Competition.

In order to solve the problem of successfully making waterways over considerable hights, the I. R. Austro-Hungarian Ministry of Commerce in Vienna has decided upon opening an international competition for that purpose. The object of the competition is the elaboration of a complete plan for a lock to overcome the incline of 35.9 m. on the Donau-Oder Canal, near Perau, in Moravia, so as to make it workable with the least quantity of water. The choice of the means to effect the above is left entirely to the decision of the competitor. The prizes offered are K. 100,000 (about $20,000), K. 75,000 (about $15,000) and K. 50,000 (about $10,000). There is besides a prize of K. 200,000 (about $40,000) offered to the successful competitor in case the execution of his design should be intrusted to somebody else, and his project is found to work satisfactorily.

South Wales Coal Arbitration.

Viscount Peel visited Cardiff recently, and as independent chairman—a position to which he was elected by the unanimous vote both of the coal owners and the miners' representatives—he presided over a meeting of the Conciliation Board for the trade for South Wales and Monmouthshire. The question at issue was the demand made by the coal owners for a reduction of 5 per cent. in miners' wages as from June 1 next. Lord Peel, having heard the arguments on both sides, decided that no case had been made out in support of the owners' demand, and consequently for the next three months wages will remain unaltered.

Profitable Iron Works.

The galvanized iron works at Bristol of John Lysaght, Limited, have so far earned sufficient to justify their capitalization to the amount of £700,000, with, in addition, debenture stock for £300,000. That is considered the more satisfactory, having regard to the large purchase consideration in ordinary and preference shares conceded to the vendors. During 1902 the company earned the very considerable profit of £135,300, after allowing for depreciation and bad debts, being an increase of £13,100 over the previous year. While, therefore, the dividend rate of 10 per cent. initiated last year is maintained, £25,000 is placed to general reserve, £1000 to workmen's provident fund and £43,700 is carried forward.

The thirty-ninth annual report of the Parkgate Iron & Steel Company, Limited, states that the works and machinery have been maintained in good working order. The construction of a new blast furnace plant and other extensions of the steel works was commenced during the past year. The work is of considerable magnitude, and it is not expected that the plant will be in working order before the close of the present year. The expenditure on the above works is likely to amount to from £80,000 to £100,000, and in order to meet this it is proposed to issue further debentures. There has been a fairly steady, though diminished demand for the products of the company during the past year, but the prices have not been favorable, owing to the extreme competition which has existed. The profit for the past year has amounted to £29,163.

The Output of Iron Ore at Bilbao.

I extract from official returns the following statement as to the quantities of iron ore that were raised in Bilbao during 1902:

	Quantity. Tons.
Red	4,182,500
Carbonate	442,237
"Campanil"	57,081
Total	4,681,818

The iron ore exported from Bilbao to various countries during the last three years was as follows:

Destination.	1900. Tons.	1901. Tons.	1902. Tons.
United Kingdom	3,101,563	2,281,198	2,996,908
Netherlands	703,766	651,473	672,368
Germany	66,401	636,509	57,688
Belgium	207,925	193,372	224,570
France	200,222	196,072	199,305
United States	49,445	90,565	45,998
Other countries	.....	7,512	14
Totals	4,329,322	4,056,701	4,196,851

It may be noted that nearly all the ore sent to the Netherlands and a part of that shipped to Belgium is destined for consumption in Germany.

Amalgamation of Steel Companies.

The trustification of British industries is proceeding at a characteristically British rate. Among the latest firms notifying amalgamation are the well-known structural steel manufacturers—Dorman, Long & Co. of Middlesbrough and the North Eastern Steel Company of the same town. The directors of Dorman, Long & Co. propose to add £500,000 to the nominal capital of the company, which will be thereby increased to £1,500,000, and to issue out of that £260,000, or as much as may be required to complete the shares in the North Eastern Steel Company, and hold the balance in reserve for contingencies.

S. G. H.

The Acker Process Company, Niagara Falls, N. Y., are erecting a stack 250 feet in hight—20 feet at the base and 10 feet in interior diameter at the top—to carry off the chlorine gas generated in the manufacture of the company's products, and which has proved very objectionable to residents of that portion of the city of Niagara Falls in which the company's factory is located. It is expected that the use of this stack will result in the waste gas being carried at least 6 miles from the plant and the city, and so disseminated that it will cease to be objectionable. The stack, now nearly completed, is being erected by builders from Chemnitz, Germany, who erected in that place the highest stack of the kind in the world—460 feet high.

It is understood that the American Refractories Company, the combination of fire brick interests in the various districts of Pennsylvania and Ohio, is still under way. It was thought that the consolidation of plants would be effected by May 25, but reports are that some of the concerns approached for the sale of their works placed too high a valuation, and that these will not be asked for further options. Of the 35 concerns originally intended for the consolidation, it seems that there will be only 25 under the new arrangement.

Comparative Test of Beehive and Retort Coke.

BY E. A. UEHLING, NEW YORK.

In this country and England the retort coke still has a formidable rival in the beehive coke. The majority of the practical furnacemen are as yet prejudiced against the former. This prejudice is due either to an entire lack of knowledge or to knowledge gained by superficial investigation. Where knowledge is lacking preconceived notions dominate. Superficial investigation generally leads to erroneous conclusions.

The prejudice against retort coke of those furnacemen and proprietors who have either not had the opportunity or have no inclination to investigate the question is based on the aversion of the average furnace manager and founder against trying something new; to experiment, as it were. "Everybody uses beehive coke. We know what it is and we had better let good enough alone." There are others—not many, let us hope—who have figured out to their own satisfaction that the coke made by the new process cannot be as good as the old fashioned beehive coke, because so many valuable constituents in the form of by-products are abstracted from the coal, and the coke must, therefore, necessarily be inferior. "The look of the stuff gives it away." Those, on the other hand, who have superficially investigated the matter, for the purpose generally of fortifying their prejudices, have found many facts to sustain their preconceived conclusions.

The first retort ovens built in the United States were of poor design, not properly proportioned for the kind of coal to be coked; perhaps also carelessly constructed and managed without the proper understanding. A flat failure was the necessary result. But even in those plants which were properly designed, as well as carefully and intelligently managed, great difficulties had to be overcome in training green hands and in getting matters working smoothly, more or less inferior coke resulting in the meantime. This, however, is equally true in starting a plant of beehive ovens in a new locality. Moreover, the coal coked in the retort ovens is generally inferior to Connellsville coal, against the coke of which the retort coke is tested. From the above it is easy to see how the prejudices against retort coke, held even among fair minded and intelligent furnacemen, found nourishment and perhaps originated in real facts observed or communicated. A thorough and unbiased investigation of the subject to-day can but lead to one conclusion—viz., that the retort oven will produce from the same coal a coke in every way equal, and in some respects superior, to the beehive as a blast furnace fuel, as we shall endeavor to demonstrate further along.

When made from the same coal there is practically no chemical difference between coke made in the properly designed and managed retort oven and well burned beehive coke, excepting as to moisture, which is generally higher in the retort coke than in the beehive coke, due to the fact that the former is quenched outside of the oven, which is unfavorable to the evaporation of the excess water used.

Physically, however, there is a notable difference between the Otto-Hoffman and the beehive coke. The former is shorter, more uniform in size and very much denser. Excepting about 5 per cent. of spongy coke which forms on top, the Otto-Hoffman coke averages about 10 per cent. more weight, bulk for bulk, than the beehive coke. It is entirely void of the metallic luster so characteristic of the latter. Its dull gray appearance is one of the chief factors in arousing the prejudice so generally held by the average furnaceman against the by-product coke. In firmness, which is one of the principal requirements in a blast furnace fuel, it appears to be fully equal to the beehive coke.

The appalling wastefulness going on in the beehive oven can only be realized by estimating the value of the by-products which could be and are actually being saved when the process of distillation is carried on in well designed retort ovens, properly equipped and intelligently managed; but this subject we shall endeavor to discuss at another time.

The object of this article is to study the relative merits of beehive and retort coke as a blast furnace fuel. For this purpose we can do no better than to study the procedure and results of a test in a blast furnace, made by the writer, of retort coke made in Otto-Hoffman coke ovens.

The test was made at a furnace of moderate size, provided with an average good equipment of blowing power and hot blast stoves. The ores smelted were a good mixture of Lake Superior. The limestone was of excellent quality. The retort coke was made in an Otto-Hoffman coke oven plant from the same mine producing the coal from which the beehive coke was made with which it was compared. All the by-products were saved in the process of coking.

As a rule about 5 per cent. of the coke from the retort oven is culled out because of its more or less spongy nature. This spongy coke forms on top of the charge and is easily separated; for this test, however, it was decided to let the entire product of the ovens go forward.

The weather was very wet during the time the coke was being made and while in transit to the furnace. The moisture was regularly determined while the coke was being charged into the furnace. The results are given in Table I. The analysis of the coke sampled in the yard before loading in cars is given in Table II. The coke having been shipped in open cars received all the rain that fell upon it, and in consequence the moisture was increased from an average of 2.7 at the works to 5.27 on arrival at the furnace, several cars having accumulated nearly 10 per cent. of moisture. The coke was well burned and showed good physical structure.

At about 3 p.m. August 11 one-eighth Otto-Hoffman coke was put on the furnace and an equivalent weight of beehive taken off. Every four hours, immediately after casting, this was repeated until one-half of the beehive coke had been displaced by the Otto-Hoffman. It was deemed prudent to allow the mixture of half and half to come through and observe the effect. The burden was not reduced, but as a precautionary measure it was deemed wise to charge a little extra coke, and one round, 5600 pounds, of coke was filled into the furnace without its quota of ore and limestone after casting—*i. e.*, every four hours.

The furnace continued running regularly, and when the half and half mixture of coke was fully at work showed by the cinder and gas that it was steadily getting hotter. Replacing the beehive with the Otto-Hoffman coke was then resumed by eighths, until at 3 a.m. on the 12th the latter was being charged alone. During the whole charging the furnace kept getting hotter. On the next morning, the 13th, all the extra fuel was then taken off, and the blast temperatures had to be reduced to prevent the furnace from getting too hot. On the 14th, continuing hot, the burden was increased from 11,330 to 11,575 pounds, an increase of 245 pounds per charge. When this burden came through the furnace indicated that the maximum load had been put on the coke. Unfortunately the increase of burden coincided with the charging of the wettest coke received into the bins during the test. The coke charged for 16 consecutive hours on the day the burden was increased was found to average nearly 6 per cent. in moisture. But for the excess of moisture the coke would, no doubt, have carried the increased burden without an off cast. As it was, though the furnace took its full quota of charges and worked without the least indication of irregularity, the analysis of the iron showed higher in sulphur and lower in silicon contents; these facts, as well as the appearance of the slag, made it advisable to add a few extra rounds of coke and to decrease the burden to 11,400 pounds. A still further reduction of burden was called for on the 17th; but no doubt this would have been temporary, since there was absolutely no sign of irregularity in the working of the furnace that would indicate a weak fuel.

The Effect of Moisture in Coke.

Moisture in coke, while not a desirable element, interferes with the economical operation of the blast furnace only because it is a variable factor. Where the coke charge is actually weighed, as was the practice at this furnace, the carbon in the charge must necessarily decrease as the moisture increases. A charge of 5600 pounds of coke containing 5 per cent. of moisture is equivalent to only 5320 pounds of dry coke. The heat required to evaporate the moisture is furnished by the waste gases, without an appreciable detriment; but the coke made from the same coal. Driving with equal rapidity, therefore, which the well developed cell structure of the retort coke permits, the ore is subjected to the reducing action of the gases 6.6 per cent. longer time, or with the same time exposure the furnace may be driven 6.6 per cent. faster with the former than with the latter fuel. Uniformity in size is also a desirable factor in a blast furnace fuel. It tends to even the charges, assists regularity of working, and thus is conducive to fuel economy.

These considerations are given space in order to

Coke Test.—Furnace Record.

Date, 1898.	Charges.	Pounds coke per charge. Beehive.	Otto-Hoffman.	Extra coke.	Pounds stone per charge.	Ore mixtures. Rex.	Granada.	Aur Mel.	Norfolk.	Bell.	Hull.	Franklin.	Pounds ore per charge.
August 7...	19	5,600	....	....	2,250	1,274	2,548	2,548	454	454	1,274	2,548	11,100
	21	5,600	....	....	2,250	1,300	2,548	2,600	455	455	1,300	2,600	11,310
	8	5,600	....	....	2,250	1,300	2,600	2,600	455	455	1,300	2,600	11,310
	31	5,600	....	....	2,250	3,900	2,600	2,600	455	455	1,300	2,600	11,310
August 8...	41	5,600	....	....	2,250	3,900	....	2,600	455	455	1,300	2,600	11,310
	40	5,600	....	....	2,250	3,900	....	2,600	455	455	1,300	2,600	11,310
August 9...	41	5,600	....	....	2,250	3,900	....	2,600	455	455	1,300	2,600	11,310
	39	5,600	....	....	2,250	3,900	....	2,600	455	455	1,300	2,600	11,310
August 10..	38	5,600	....	5,600	2,250	3,900	....	2,600	455	455	1,300	2,600	11,310
	39	5,600	....	5,600	2,250	3,900	....	2,600	455	455	1,300	2,600	11,310
	15	5,600	....	....	2,250	3,900	....	2,600	455	455	1,300	2,600	11,310
	15	5,600	....	....	2,250	2,980	....	2,600	455	455	1,300	2,600	11,310
August 11..	11	4,900	700	....	2,150	2,980	....	....	....	....	....	....	....
	5	4,200	1,400	....	2,150	2,980	....	2,980	450	450	1,490	2,980	11,310
	13	5,500	2,100	....	2,150	2,980	....	2,980	450	450	1,490	2,980	11,310
	11	2,800	2,800	11,200	2,150	2,980	....	2,980	450	450	1,490	2,980	11,310
	12	2,800	2,800	....	2,150	2,980	....	2,980	450	450	1,490	2,980	11,310
	..	2,800	2,800	5,600	2,150	2,980	....	2,980	450	450	1,490	2,980	11,310
	32	2,100	3,500	5,600	2,150	2,980	....	2,980	450	450	1,490	2,980	11,310
August 12..	9	1,400	4,200	5,600	2,150	2,980	....	2,980	450	450	1,490	2,980	11,310
	14	700	4,900	5,600	2,150	2,980	....	2,980	450	450	1,490	2,980	11,310
	11	....	5,600	5,600	2,150	2,980	....	2,980	450	450	1,490	2,980	11,310
	14	....	....	Otto.	2,150	2,980	....	2,980	450	450	1,490	2,980	11,310
	14	....	5,600	5,628	2,050	2,980	....	2,980	450	450	1,490	2,980	11,310
August 13..	19	....	5,600	2,800	2,050	2,980	....	2,980	450	450	1,490	2,980	11,310
	4	....	5,600	....	....	2,980	....	2,980	450	450	1,490	4,470	11,310
	39	....	5,600	....	2,050	2,980	....	2,980	450	450	....	4,470	11,310
August 14..	30	....	5,600	....	2,050	2,980	....	2,980	450	450	....	4,470	11,310
	10	....	5,600	....	2,050	3,050	....	3,050	450	450	....	4,575	11,575
	41	....	5,600	....	2,050	3,050	....	3,050	450	450	....	4,575	11,575
August 15..	41	....	5,600	....	2,050	3,050	....	3,050	450	450	....	4,575	11,575
	40	....	5,600	....	2,050	3,050	....	3,050	450	450	....	4,575	11,575
August 16..	24	....	5,600	8,400	....	3,050	....	3,050	450	450	....	4,575	11,575
	16	....	....	....	....	3,050	....	3,000	450	450	....	4,500	11,400
	39	....	5,600	5,600	....	3,050	....	3,000	450	450	....	4,500	11,400

Date, 1898.	Total pounds. Coke.	Stone.	Ore.	Iron remelted.	Total iron produced. Pounds.	Tons.	Pounds.	Burden yield.	Pounds coke per 2,268 pounds iron.	Fuel ratio. Coke to iron.	
August 7	442,400	177,750	889,500	59,250	526,634	232	458	54	2,120	92	
August 8	453,600	182,250	916,110	60,750	588,550	259	1,138	57	1,942	85	Average 873
August 9	448,000	180,000	904,800	60,000	568,109	250	1,109	56	2,000	88	
August 10	436,800	173,250	870,870	57,750	571,960	252	424	58	1,924	84	
August 11	470,400	177,800	928,760	61,500	574,528	253	724	56	2,062	91	
August 12	470,000	174,150	917,730	60,750	619,064	272	2,168	60	1,926	85	Average 888
August 13	434,000	157,200	861,080	57,000	530,387	233	1,943	55	2,086	92	
August 14	453,600	166,050	937,575	60,750	577,490	254	1,418	56	1,981	87	
August 15	453,600	166,050	937,575	60,750	625,779	275	2,079	60	1,814	80	Average 840
August 16	456,400	161,950	904,800	59,750	590,624	260	944	58	1,976	87	

Date, 1898.	Blast. Cubic feet per minute.	Average temperature.	Pressure.	Analysis of slags. Silica.	Alumina.	Lime.	Mg. ox.	Analysis of iron. Silica.	Sulphur.	Phosphorus.
August 7	24,253	1,009½	7¾ to 8¼	....	....	....	....	1.295	0.0348	0.091
August 8	24,807	1,045⅝	7½ to 9	34.62	15.80	42.69	5.87	1.178	0.033	0.090
August 9	24,807	1,033⅓	8¼ to 9	35.10	13.96	40.54	8.43	1.148	0.0316	0.089
August 10	24,807	1,020⅝	7¼ to 8¾	33.68	12.48	41.40	10.39	0.958	0.0398	0.088
August 11	24,807	991⅔	7¾ to 9	32.28	13.42	41.77	10.62	0.96	0.0346	0.089
August 12	24,807	975	7½ to 8½	33.72	15.18	42.20	8.68	1.046	0.0406	0.089
August 13	24,807	870⅝	8¼ to 9	32.58	14.40	43.25	8.77	1.295	0.0313	0.088
August 14	24,807	925	8 to 8¾	33.88	15.06	41.28	8.58	1.061	0.0366	0.087
August 15	24,807	933½	7 to 9¼	33.56	14.04	42.20	8.50	0.931	0.0426	0.081
August 16	24,807	979⅛	7½ to 8½	38.50	14.14	38.51	8.36	0.971	0.0495	0.082

carbon deficiency caused by the water contained in the coke is in effect equivalent to a proportional increase of burden, and a true comparison can only be made between two cokes of different moisture contents, as to their value as a blast furnace fuel by taking the latter into account.

The Effect of Density.

Density in a blast furnace fuel manifests itself by effecting an increased capacity for charges in the furnace in which it is used. Since the beehive coke occupies about double the space which is taken by its burden of ore and flux, it follows that a furnace using Otto-Hoffman coke, the latter being 10 per cent. denser, will contain 6.6 per cent. more stock than it would with beehive

show that the comparatively very favorable results obtained can be accounted for, and are due to properties peculiar to the Otto-Hoffman coke.

Comparison of Results.

There were four full days run with Otto-Hoffman coke, from August 13 to 16 inclusive. The transition having been made gradually during the 11th and 12th, we can therefore do no better than to take an equal number of days of the record of the beehive coke, and since the four days just preceding the change from one coke to the other happen to show at the same time the best work done by the beehive coke during the blast, this

must be conceded to be perfectly fair to the latter. The dates taken for comparison are, therefore, the 7th, 8th, 9th and 10th for the beehive, with the 13th, 14th, 15th and 16th for the Otto-Hoffman coke, not taking into consideration the two days occupied for making the change.

The general furnace records showed that on the 7th the burden was increased from 11,100 to 11,310 pounds, and that this burden was kept on the furnace during the four days under consideration. It appears, however, that this was all the beehive coke would carry under the atmospheric conditions prevailing, since it was not only found necessary to heat the blast to its highest available temperature—viz., 1050 degrees—but was deemed advisable to add two rounds of extra fuel to keep the furnace at its proper heat. The furnace ran very regularly during these four days, taking respectively 79, 81, 80 and 77 charges per day; the falling off of three charges the last day may be ascribed to the extra coke charged. The iron was all good, averaging 1.10 per cent. in silicon and 0.034 per cent. in sulphur.

The procedure of changing from the beehive to the Otto-Hoffman coke has already been described in detail. In consequence of precautions taken the furnace showed an excessive heat when the full charge came down. In ordinary furnace practice the burden would have been gradually increased at once. Dealing with a comparatively untried fuel, it was deemed wiser to bring the excess of heat down temporarily by reducing the temperature of the blast until it could be ascertained with certainty that the fuel persisted in demanding a higher burden. The temperature of the blast was therefore reduced to 900 degrees and below for 36 hours, and at short intervals it had to be decreased below 800 degrees to keep the furnace from working too hot, giving proof positive that more burden was required for normal working. The burden was increased on the 14th p.m. from 11,310 to 11,575 pounds, and kept on until the 16th, when it was reduced to 11,400 pounds, made necessary because of the excessive moisture in the coke and humidity of the air.

The furnace took respectively 76, 81, 81 and 79 charges per day for four days, exactly the same total number as with the beehive coke. The furnace was remelting a considerable amount of off iron which had been accumulated during the previous blast. During the respective periods compared 237,750 pounds were charged on the beehive and 238,250 pounds on the Otto-Hoffman coke, a difference of only 500 pounds. This factor may, therefore, be considered on a balance. The total iron product, including that remelted, was respectively 995 and 1025 tons, a difference of 30 tons in favor of the Otto-Hoffman coke, due principally to the higher burden carried by the latter.

The iron produced by the Otto-Hoffman coke averages slightly lower in silicon and higher in sulphur, containing 1.06 and 0.039 per cent. respectively, as against 1.10 and 0.035 per cent. in iron made with the beehive coke. The column of analysis shows that there were three casts of iron over the Bessemer limit in sulphur, caused by factors not directly depending on the coke, but due to underweight of carbon because of moisture and to excessive humidity of the atmosphere.

The ratio of pounds of coke per pound of iron as given by the furnace record averages for the beehive 0.873 and for the Otto-Hoffman 0.865. These figures are based on the coke as weighed into the furnace and the iron as weighed out from the cast house, giving a yield of iron from the burden of respectively 56.33 and 57.23 per cent. for the ores smelted by the beehive and Otto-Hoffman coke. This discrepancy in the yield in favor of the Otto-Hoffman coke is manifestly wrong, because the ores used with either coke were practically the same, and this difference must, therefore, be rectified.

The average yield in the furnace of the ore mixture used for the blast having been found to be 58 per cent., this is used as a basis in obtaining the figures for comparison of the efficiency of the two cokes. In the four days from the 7th to the 10th 1,780,800 pounds of coke were weighed into the furnace. The average moisture in the beehive coke, so far as ascertained, was 3.07 per cent. Deducting this we get 1,726,129 pounds of dry coke, and the figures of the furnace record showing the burden carrying capacity are thereby modified as follows:

	Pounds of Beehive coke per pound of iron.
Average of furnace record	0.873
Based on wet coke, 58 per cent. ore yield	0.865
Based on dry coke, 58 per cent. ore yield	0.831

It took, therefore, 0.831 times 2268, or 1885, pounds of dry beehive coke to make a ton of sand iron. Of the Otto-Hoffman coke there was weighed into the furnace from August 13 to 16 1,797,600 pounds. The average moisture of this coke was found to be 5.38 per cent. Deducting this we get 1,664,937 pounds of dry coke. Figuring the burden carrying capacity as before, we have:

	Pounds of Otto-Hoffman coke per pound of iron.
Average of furnace record	0.865
Based on wet coke, 58 per cent. ore yield	0.851
Based on dry coke, 58 per cent. ore yield	0.788

making the consumption of dry coke $0.788 \times 2268 = 1787$ pounds per sand ton, a difference of 98 pounds per ton of iron in favor of Otto-Hoffman coke.

To make the results obtained quite comparable the temperature of the blast and the humidity of the air must also be taken into consideration.

Consideration of the Effect of the Heat Supplied by the Blast.

A principal factor in the economy of a blast furnace is the temperature of the blast, and since the beehive coke received its blast at an average temperature of 1014 degrees, while the average heat at which it was supplied to the Otto-Hoffman coke was only 924 degrees, this difference of 90 degrees must be taken into consideration.

In the four days' run of Otto-Hoffman coke there was pumped into the furnace by engine measurement 139,985,900 cubic feet of air, which, taken at the temperature of the engine house—viz., 90 degrees—and at an average barometric pressure of 30 inches, would weigh $139,985,900 \times 0.071 = 9,938,999$ pounds. The total weight of dry coke fed into the furnace during the four days was 1,664,937 pounds, containing 87.7 per cent; therefore $1,664,937 \times 0.877 = 1,460,150$ pounds of carbon. Since this carbon cannot be oxidized higher than to carbonic oxide by the oxygen of the blast, and since it takes 4.87 pounds of air to burn 1 pound of carbon to carbonic oxide, it follows that the maximum requirement of air to burn the coke consumed cannot exceed $1,460,150 \times 4.87 = 7,110,930$ pounds. On the further assumption, fully warranted by the chemical conditions prevailing in the furnace, that 20 per cent. of the carbon is oxidized by direct contact with the ore and flux, we get $7,110,930 \times 0.80 = 5,688,584$ pounds of air actually consumed by the furnace. There is, therefore, a discrepancy between engine measurement and actual consumption in the furnace of $9,035,443 - 5,688,584 = 3,346,859$ pounds, or over 37 per cent., showing how unreliable the ordinary blowing engine is as an air meter.

This discrepancy is composed of the aggregate of the following factors:

1. Loss through leakage in cold and hot blast mains and connections, stoves and valves. These losses are generally much larger than the men responsible for keeping the joints tight would be willing to admit.

2. Loss in the blowing engine: *a*, Leaky valves; *b*, leakage past the piston; *c*, clearance.

3. Condition of atmosphere: *a*, Temperature of air in cylinder at beginning of compression above engine house temperature; *b*, barometric pressure below the average considered.

Of all of the sources of loss only the clearance and the barometric pressure can be accurately determined, and for this reason calculations based on engine measurement are never reliable. We come very much closer to the true quantity of air consumed by basing it on the chemical requirement. Taking, therefore, 5,688,584 pounds of dry air at a deficiency of 90 degrees, we have $5,688,584 \times 90 \times 0.24 = 122,873,414$ B. T. U. The observed average humidity (see Table III) was 1.25 per

cent. of the total weight of air; we must, therefore, add to the above $\frac{5{,}688{,}584 \times 1.25}{100}$ =71,107 pounds of moisture carried in by the blast, causing a deficiency of 71,107 × 90 × 0.48 = 3,071,822 B. T. U. Adding this to the above, we have 122,873,414 + 3,071,822 = 125,945,236 B. T. U., which is the equivalent of $\frac{125{,}945{,}236}{4450}$ = 28,145 pounds of carbon, which makes $\frac{28{,}145}{0.877}$ = 32,090 pounds of coke to which the deficiency of 90 degrees of blast is equal.

There were 931 tons of iron reduced from the ore by the Otto-Hoffman coke, hence this coke must be credited with $\frac{32{,}090}{931}$ = 34.4 pounds per ton of iron. By doing this we find that the true comparative consumption for the beehive coke was 1885 pounds and the Otto-Hoffman coke 1787 — 34 = 1743 pounds respectively, a difference in favor of the latter of 142 pounds per ton of iron.

Humidity of the Air.

Water entering into the hearth of a blast furnace, either from a leak in the cooling appurtenances or through the tuyeres with the blast, is the most serious disturbing factor in the operation of a blast furnace. This is readily understood when we consider that all the water entering must be decomposed, and to decompose a pound of water vapor $\frac{51{,}717}{9}$ = 5764 B. T. U. are absorbed. Since this loss of heat occurs in the hearth of the furnace it can only be neutralized by the combustion of carbon to carbonic oxide, generating 4450 B. T. U. per pound of carbon, and hence every pound of moisture brought in by the blast requires $\frac{5746.33}{4450}$ =1.25 pounds of carbon to overcome the chilling effect it produces.

We have shown above that 71,107 pounds of water vapor were carried into the furnace during the four days under consideration, hence a chilling effect was produced by the humidity of the blast requiring $\frac{71{,}107 \times 1.29}{0.877}$ = 104,593 pounds of coke, or $\frac{104{,}593}{931}$ = 112 pounds of coke per ton of iron.

Since there were no observations of the humidity of the blast made during the regular running of the furnace, we are compelled to assume that practically the same atmospheric conditions existed during the four days' run on beehive coke taken for comparison. The above figures, however, serve to show the great importance of moisture in the blast. On one occasion, in the writer's own experience, an immediate reduction of 150 pounds of fuel was effected by overhauling all the leaky steam joints in the blowing engine room, yet the master mechanic did not consider the leaks bad from his point of view.

Since there is always more or less unavoidable steam leakage about every steam blowing engine, the German practice to take the air from the outside is to be commended. More effective still in overcoming this source of fuel waste would be the installation of gas blowing engines. These few remarks, however, are only by the way.

Recapitulation and Comparison of Observations and Results.

Blast, quantity and condition.	Beehive.	Otto-Hoffman.
Volume cubic feet per minute, piston displacement	24,500	24,500
Temperature in degrees, average	1,014	924
Pressure in pounds per square inch, average	8.10	8.35
Humidity (dew point) assumed to be the same, per cent	1.25	1.25
Ore mixture and flux the same for both.		
Number of charges	317	317
Tons of iron produced as per furnace record, including iron remelted	993	1,022
As calculated on 58 per cent. ore yield	911	931
Coke used as per furnace record, pounds	1,780,800	1,797,600
Coke used after deducting moisture, pounds	1,726,129	1,664,937

Coke Consumption in Pounds per Pound of Iron.

	Beehive.	Otto-Hoffman.
As per furnace record	0.873	0.865
Based on 58 per cent. ore yield (wet coke)	0.862	0.851
Based on 58 per cent. ore yield (dry coke)	0.831	0.788
Crediting Otto-Hoffman coke with difference in blast temperature	....	0.764

Pounds of Coke per ton (2,268 Pounds) of Iron, 58 Per Cent. Ore Yield.

	Beehive.	Otto-Hoffman.
Coke as charged into furnace (wet)	1,955	1,930
Dry coke as charged into the furnace	1,885	1,787
Crediting open hearth coke with difference in temperature of blast	....	1,743

These results show that, all things observed, the Otto-Hoffman coke smelted a ton of iron with 1885 — 1743, or 142 pounds, less fuel than the beehive. Although we have shown that the coke would have carried more burden in the beginning and have shown causes independent of the coke fully accounting for the few casts of off iron produced, it is only fair to assume that the weight of carbon set to the credit of the Otto-Hoffman coke on account of deficiency in the blast temperature would have been required to bring the quality of the iron up to that produced by the beehive coke. Doing this, we still have a margin of 1885 — 1787, or 98 pounds, per ton of iron in favor of the Otto-Hoffman coke.

Table I.—Per Cent. Moisture in Otto-Hoffman Coke Samples Taken from Charging Buggies During Intervals of Four Hours

Frick coke.						
August	Otto-Hoffman coke.					Average
2.88	4.20	4.62	5.26	3.01	3.01	
11-12.	Aug. 12.	Aug. 13.	Aug. 14.	Aug. 15.	Aug. 16.	13-16 incl.
3.19	6.66	3.76	7.63	7.52	7.52	
...	6.06	7.30	6.87	4.57	4.51	5.38
...	5.15	5.04	8.76	5.04	2.89	
...	...	...	8.38	5.12	3.82	
...	...	...	4.55	3.76	5.88	
3.03	5.52	5.18	6.91	4.84	4.60	5.38

The truest measure of the economic working of a blast furnace is given by the ratio of CO to CO_2 in the gas. From Table IV we see that with the exception of the 13th, when the extra fuel was put on as a measure of precaution, this ratio indicates clearly the superiority of the Otto-Hoffman coke.

Table II.—Analysis of Otto-Hoffman Coke Sampled at Coke Ovens.

Fixed carbon.	Volatile matter.	Ash.	Phosphorus.	Sulphur.	Moisture.
87.24	1.04	10.98	0.0120	0.73	4.40
87.81	1.00	10.44	0.0121	0.74	0.60
87.76	1.07	10.39	0.0088	0.79	3.40
87.79	1.02	10.44	0.0086	0.74	4.00
87.84	1.07	10.34	0.008	0.73	2.00
87.76	1.01	10.46	0.009	0.76	1.80
		Average.			
87.70	1.04	10.51	0.0083	0.75	2.70

Table III.—Humidity of Atmosphere August 12-17, 1898.

Date, August.	Hour.	Temperature. Dry bulb.	Wet bulb.	Dew point.	Average.	Moisture. Per ct.
12	8 a.m.	75.5	72	67.4		
12	11 a.m.	78.5	75	70.4	66.766	1.4
12	3 p.m.	80	72.5	62.5		
13	8 a.m.	71.5	67.5	62.2		
13	11 a.m.	78.5	68.5	55.2	57.366	1.0
13	3 p.m.	78	68	54.7		
14	10 a.m.	78.5	68.5	55.2		
14	7 p.m.	80	75	68.4	64.533	1.29
14	11 p.m.	70	70	70		
15	3 a.m.	70	68	65.4		
15	11 a.m.	85	75	61.7		
15	3 p.m.	86	75.5	61.6	64.76	1.31
15	7 p.m.	83	76	66.7		
15	11 p.m.	80	75	68.4		
16	3 a.m.	78	72	66.0		
16	8 a.m.	84	75.5	64.2		
16	11 a.m.	87	77.5	64.9	66.85	1.41
16	3 p.m.	92	87.5	81.6		
16	7 p.m.	83	75	66.7		
16	11 p.m.	81	71	57.7		
17	3 a.m.	81	76	69.4		
17	7 a.m.	82	74	63.4		
17	11 a.m.	84	73	58.4	64.3	1.28
17	3 p.m.	87	77.5	64.9		
17	7 p.m.	84	76	65.4		
Average humidity, August 13-16 inclusive					63.25	1.25

Table IV.—Gas Analysis.—August 12-17, 1898.

Date. August.	Hour.	CO_2.	O_2	CO.	Ratio CO to CO_2.	Average.
12	2.15 p.m.	14.6	0.4	23.8	1.6	1.6
13	8.15 a.m.	13.0	0.3	23.7	1.8	1.85
13	2.30 p.m.	12.7	0.3	25.2	1.9	
14	10.00 a.m.	14.6	0.2	23.4	1.6	
14	2.30 p.m.	15.0	0.1	22.7	1.5	1.566
14	10.30 p.m.	13.8	0.0	23.0	1.6	
15	3.00 a.m.	13.0	0.8	20.8	1.6	
15	10.30 a.m.	15.0	0.2	21.8	1.44	
15	2.30 p.m.	15.0	0.2	20.0	1.33	1.428
15	6.30 p.m.	14.6	0.2	19.2	1.31	
15	10.30 p.m.	14.4	0.1	21.1	1.46	
16	2.30 a.m.	15.0	0.0	19.8	1.32	
16	8.00 a.m.	15.0	0.1	20.4	1.36	
16	10.30 a.m.	15.2	0.2	22.0	1.44	
16	2.00 p.m.	15.8	0.2	20.8	1.30	1.405
16	3.20 p.m.	14.0	0.8	20.8	1.40	
16	6.30 p.m.	13.4	0.6	20.0	1.49	
16	11.00 p.m.	14.0	0.5	22.3	1.53	
17	2.30 a.m.	12.3	0.1	22.6	1.88	
17	10.20 a.m.	14.6	0.2	22.2	1.61	1,612
17	2.30 p.m.	14.8	0.2	21.6	1.45	
17	6.30 p.m.	14.6	0.2	22.4	1.53	
CO to CO_2 average						1.52
CO_2 to CO average						0.658

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The American Merchant Marine.

The subject of reviving the American merchant marine is not being permitted to languish because of the discouragement encountered by those who are endeavoring to secure Government aid in this direction. That the friends of the American ocean carrying trade are actively at work is shown by some recent occurrences. The Ohio Republican State Convention the past week embodied among their resolutions a clause stating "We favor every encouragement possible to our merchant marine in the extension of American commerce and American ships upon every sea." A few days previously the New York Board of Trade and Transportation appointed a special committee to inquire into "the alarming state of American shipping in the foreign trade." The instructions to this committee are that they shall lay the subject before commercial associations, labor associations and all other interests concerned in the increase of our deep sea tonnage; that the press of the country be invited to help in ascertaining and reporting public opinion as to the best means by which our shipping may be built up; that all sides of the question be discussed thoroughly and without regard to political or economic bias, and that the committee report its conclusions to the board not later than December 1, 1903. The resolutions which were adopted by the board, and in pursuance of which the committee was appointed, are couched in forcible language. They recite the imperative need of the revival of American shipping in the foreign trade, stating that our deep sea tonnage has shrunk to one-third of the total of 1861, and that most of our ocean commerce, which used to employ scores of shipyards and thousands of skilled mechanics, is now being monopolized by other nations. They claim that the larger part of American commerce ought rightfully to be carried by American ships; that the American people must have prosperous shipyards and a great merchant fleet as a bulwark of their trade and the indispensable reserve of their fighting navy, and that shipbuilding and navigation, bringing a fair gain to capital and labor, are as vital to the nation's defense as armor clads and guns.

The points which are set forth in the resolutions adopted by the New York Board of Trade and Transportation are not new. They have been stated in various ways and at many times for a long series of years. The condition of the shipping trade is not any more "alarming" than it has been for 35 or 40 years. During that whole time the desirability of securing a greater share for American shipping interests in our foreign trade has been universally recognized, but the views which are held regarding the method by which American ocean shipping can be revived are unfortunately as diverse now as at any previous time. The advocates of a subsidy claim that they have the only practicable scheme. Those who favor the abolition of our registry laws claim just as strenuously that if the way was open for the registration of foreign built ships under the American flag it would be followed by a continuous addition to our merchant marine, which would in time build up the ocean shipping trade of this country to its old position. It is pointed out by others that, despite the discouraging conditions, the tonnage in our ocean carrying trade is steadily increasing, even if the yearly increase is slight, and that natural causes will gradually bring about a change in this respect, even if no stimulus is given by legislation. Even advocates of a subsidy are by no means united, as every proposition of that kind is vigorously fought by those who have a slightly different scheme. It has been impossible thus far to reconcile the views of a sufficient majority in both Houses of Congress so that a scheme really productive of benefit to the merchant marine could be adopted. Meanwhile our foreign trade has grown to exceed that of any other country.

The hopes which have been entertained that private interests might develop plans to be carried through by large combinations of capital, on a totally independent footing, which would speedily cause a heavy diversion of the ocean carrying trade to American bottoms are not being realized. When the great International Mercantile Marine Company were organized it was supposed that, through the instrumentality of this combination of American as well as foreign capital, with its control in American hands, some ocean prestige would be gained by American interests, but the policy of that company appears to be to maintain the relations previously existing with regard to the ships owned by the subsidiary companies and the new ships to be built. Thus, instead of favoring the shipyards of this country, the new vessels contemplated by this company will be built abroad to a great extent. The formation of the company, in fact, dampened very considerably the prospects of Government aid to shipping interests which might have been extended by this country. It was foreseen that any subsidy would greatly inure to the direct benefit of this huge aggregation of marine interests.

The most vigorous development in our ocean shipping in recent years has been in connection with American railroad companies, who for their own business reasons have desired to extend their terminals to points beyond the sea. Advantages have probably been gained in this way which have offset the greater cost of transporting freight in American vessels as compared with vessels sailing under the flags of foreign nations, but this movement is not sufficiently important to be relied upon for adding the great amount of tonnage to the American merchant marine which is necessary to secure for this country its proper representation in transoceanic trade. It is unquestionably necessary that capitalists should see sufficient returns on any investments they might make in ocean shipping to warrant embarking in that field of commercial enterprise. For 40 years or more the opportunities for American capitalists to get good profits on their investments have been vastly better in railroads, in manufactures and in mines than in the shipping trade, and therefore they have devoted their energies to building up business interests on land. It is possible that if we wait long enough the returns from such land investments will through unfavorable trade conditions fall so low that the attention of moneyed men may be more strongly directed toward ventures on the sea, but, even should such conditions prevail, the fact that the vessel owners of other nations are so strongly backed by their Governments will make it a difficult matter to secure a good footing in established channels of ocean transportation. A report made last winter by a select committee of the British Parliament gave a very interesting statement of the subsidies being paid to their shipping interests by Russia, Austria-Hungary, Italy, Holland, Sweden, Norway, Denmark, Belgium, France, Ger-

many and Great Britain. All these countries assist their ship owners by the payment of subsidies in some form, and in numerous instances these subsidies are in addition to what may be paid for postal or naval purposes. Some of them also give additional encouragement to their ocean shipping by making specially low freight rates on State owned railroads on commodities imported or exported. Even though these subsidies may not apply to some of the great lines traversing the Atlantic, yet the fact is pointed out that these lines are usually owned by shipping companies receiving subsidies on other routes which enable them to carry any loss incurred in their transatlantic service.

The question is one of very great importance, and it invites unceasing attempts at solution, notwithstanding the fact that so many years have passed without the accomplishment of practical results. These attempts will undoubtedly be continued until, at some time, a basis is reached to which sufficient support will be given to secure its adoption by Congress. In this connection some consideration is being given to the policy of making a discriminating duty on goods imported in American bottoms. This was the policy which prevailed during the early days of the republic. The advocates of this policy believe that a reduced duty, say 10 per cent., on imports in American vessels would be a sufficient influence to turn the attention of capitalists with more favor toward American shipping. Possibly this would be less objectionable than other plans for Governmental aid. It would certainly be free from the abuses to which the subsidy scheme is liable.

The Western Real Estate Boom.

There is a real estate speculation in the West which will bear watching by persons observant of financial signs, partly because it is liable to absorb money at a time when money is especially needed for crop moving and partly on account of the intimate relation between real estate booms that are overdone and panics and depressions.

Attention in the East was first directed to this real estate movement about a year ago, when Washington dispatches said that Mint Director Roberts, an Iowa man, reported an unprecedented movement in farm lands in several Western States, beginning with his own and extending into British provinces. In Iowa, he said, farm values had advanced in two years fully $20 an acre, and no good farm lands could be had for less than $50 an acre. The advances on cheaper lands in Minnesota and the Dakotas were even greater, proportionately. Later last summer Mr. Roberts returned from a trip to his home with the information that "there is the greatest amount of land speculation going on west of Chicago that has ever been known in that part of the country." He believed the country banks were loaning a good deal of money on these land enterprises, and that this was the real secret of the early movement of money westward. People were organizing syndicates to buy land; there was hardly a cross roads community in Iowa that was not operating in the Dakotas or in Canada. Prices had advanced 50 per cent. in two years and were still rising.

Early last spring a prominent New York bank obtained from various parts of the country, and made public, reports on commercial conditions. These contained a good deal of significant, but scarcely noticed, information regarding this boom. The head of a Kansas bank wrote that lands had increased in value, and in three-fourths of the sales full cash was paid. The president of "one of the strongest banks in the Northwest" reported, "there is, of course, a large speculation in farm lands, which has been felt by our country banks in the loss of deposits, and a call for additional money in the way of loans, to make payments on such purchases." A large wholesale dry goods house in Minnesota reported as to the financial situation, "The unfavorable feature has been the sudden and unexpected speculation in farm lands. Farmers began to sell their real estate in Iowa at high figures, and the speculative fever spread to Minnesota, then to the Dakotas, and finally into Manitoba. Unfortunately, this land speculation was participated in by country merchants, by traveling salesmen and many others, and has in the aggregate reached such large proportions that it is likely to involve many people before the end is reached." A large dry goods house in Illinois said, "There is no sign of undue speculation in the West except in Iowa, where many merchants, bankers, farmers, &c., have bought land in North Dakota and Canada, paying about 20 per cent. down and the balance in five or six years' time." A wholesale hardware and iron house in Minnesota said, "The only dark cloud on the horizon is the widespread speculation in farm lands indulged in by farmers and country merchants to some extent, and very generally by country bankers. Should there be good crops throughout the Northwest the coming season the magnitude of these speculations will probably never be known, while, on the other hand, should a failure occur many of these speculators will have trouble." The president of another national bank in the Northwest said, "There has been no speculation the past two years, except the buying and selling of wild and farming lands. A very large amount of land has been sold, and considerable of this has been paid for at this time, but probably a much larger amount is only partially paid for. Payments aggregating a large amount of these land contracts matured in March, 1903. These payments have been provided for better than anticipated. One land dealer reports that he has had no trouble, and that payments on his land contracts have been very satisfactorily made this spring."

A letter from Kansas City, of a much more recent date, to an Eastern financial paper, quotes a loan broker of Central Kansas as saying, "The chief demand (for money) is from buyers of land who are paying high prices, and these may bring foreclosures some day." In reviewing monetary conditions, a New York financial paper said, "The enormous yield of wheat this year may have a similar effect upon Western land speculation, as did the large crops of wheat and corn last year. Then, it will be remembered, an active inquiry for money for the purchase of lands in the grain growing States of the West served not only to arrest the return movement of funds to this center, after the crop moving season, but to draw hence considerable amounts. . . . Last year land speculation was a new and entirely unexpected factor, somewhat deranging the calculations of bankers, who had not considered such a movement probable or even possible. Now these bankers will profit by last year's lesson, and they will be likely to make preparations for this exceptional demand."

Kansas City reported a month after the customary date for land settlements that the craze for farm lands was unabated, prices higher than ever before, and lands selling freely at $5 to $10 an acre. "This movement cannot continue forever. When it ceases, or when the advance guard meets with a season or two of drought and crop failure, the land craze will come to a sudden halt and values will fall again. The present movement is not confined to farm property; city realty is affected as well.

. . . Real estate business in Kansas City has doubled in the past two years. The same or similar conditions exist in other parts of the prairie West, and the towns, as well as the cities, are in the movement." In April the Canadian Pacific announced an advance of the prices of its lands to $5 and $10 an acre, as against $3 to $7 an acre a year before. In some of the populous districts demand for land had raised prices to $20 and $30 an acre.

In the latter part of May a dispatch from Topeka quoted an officer of an interior bank as predicting higher money in the West by midsummer. "The demand for funds with which to move the crops will not alone cause this. There has been loaned a large amount of the Western funds in realty mortgages. The loan agents of the interior towns report that more than half of their loans have been placed with home people. This has tied up a great deal of the money saved from the good times, and the land craze has taken another slice." The same dispatch adds, "Scarcely a town but has one or more companies investing in oil or mine properties somewhere. The range of speculation also extends to the most chimerical of manufacturing enterprises, comprising the making of everything from novelties to axle grease. . . . This uses up much of the investment fund; it calls for the retirement of sums formerly at the disposal of the communities through the banks. Taken in connection with the building and improvement plans, there is being utilized a large per cent. of the West's savings. This does not mean that it is wasted, but that it is tied up, and that the current applicants may be deprived of much that is normally due them."

In April the reports to the Comptroller of the Currency showed that the resources of the Western national banks were generally less relatively, and often less absolutely, than a year before. The financial report of the Chicago *Tribune*, in the middle of May, noted that "it is estimated that the country balances are now between $2,000,000 and $4,000,000 less than they were three weeks ago. It appears that there is a good demand for money in the West. Just what special use there is for funds at this time is not apparent, since it is too early for ordinary crop moving requirements." Presumably the real estate speculation is absorbing all available funds before the time for moving the crops arrives.

This record of Western land speculation is worth considering in relation to the monetary situation next fall and the general business conditions of the country for the next two or three years.

The Inefficiency of the Ordinary Lathe for High Speed Cutting.

Elsewhere in this issue is an article by H. M. Norris of Cincinnati, Ohio, which will repay the most careful study, particularly on the part of designers and builders of machine tools. It embodies certain truths which have been acknowledged for a long time, but which have not been promulgated or practically exploited by manufacturers, nor demanded by users of these tools. The adoption of the ideas presented would take away certain "talking points," and would therefore be unfavorably received by the salesman. It would be necessary to overcome the prejudice of the mechanic, who thinks he must have a tool provided with a vast range of speeds, most of which he never uses and the majority of which he could not use economically if he wanted to.

Mr. Norris first ascertained the most advantageous speed at which to run a lathe on work from 1 to 4 inches in diameter, and then designed a lathe to meet the requirements. He established a maximum and minimum, between which the construction was rigidly confined. The experiments showed that white chips do not indicate that a tool is operating at less than its maximum speed; that the advantages of using water are too slight to warrant its employment in general practice, and that it is inexpedient to operate on the average grade of steel at a greater speed than 175 feet per minute. To meet these demands it was not necessary for the lathe spindle to run faster than 668 revolutions per minute, nor slower than 167. With 12 speeds the desired speed of 175 feet could be obtained with a variation of less than 10 per cent. These speeds are derived from a three-step cone, a back gear having a ratio of 2.13 to 1 and a two-speed friction countershaft.

This lathe was tested in comparison with a standard 18-inch lathe built by one of the best known makers in the country. It is here we find the criticism which is the keynote of the whole discussion. Regarding the speeds on this machine, it is stated that they are eminently unsuited for high speed cutting. "They are as unfit to produce economical results as a blind man is to read a micrometer or to scrape in the platen of a milling machine, and how any one can claim that they are all right is beyond my understanding. It has been shown that the maximum speed need be but four times faster than the minimum speed, while on this machine the maximum speed is more than 111 times the minimum speed. If, therefore, the lathe is speeded so that its maximum speed will cut a 1-inch shaft at the rate of 175 feet per minute, it will obviously require a diameter of 111 inches to maintain the same cutting speed when running at the minimum speed, which is rather a large piece to swing in an 18-inch lathe. And what is true of the slowest is true of the six others." The average cutting speed on the new lathe is 25 per cent. more efficient than on the other. The article further dwells on the greater cut taken by the special lathe and the greater arc of contact of the driving belt.

The reasoning which led to the construction of this lathe could be applied with equal force to other standard tools. The time has arrived when a special tool is confined exclusively to one particular job. This is true in all large establishments, where the strictest economy prevails and where the greatest possible output is expected of each machine. Such being the case, the machine having a great range of feeds and speeds will probably be found in the small shop, which cannot duplicate its outfit, and which must, in consequence, have tools of wide scope. Mr. Norris has started the discussion, and we should not be surprised if radical changes followed.

CORRESPONDENCE.

The Establishment of Government Proof House.

To the Editor: The article on "Governmental Testing of Firearms" in *The Iron Age* of June 4, brought before your readers a subject that has not heretofore been given the serious consideration it deserves.

Foreign nations have enacted laws for the protection of their people against the sale of unsafe firearms, the United Kingdom of Great Britain being among the first to provide this safeguard against careless or unscrupulous manufacturers, they insisting that all firearms offered for sale must bear the Government Proof House test stamps, or the stamp of some other Government Proof House, whose testing has been approved by the British Government, and thus our English cousins guarantee that all firearms offered for sale are safe.

This is not done at the expense of the Government, but a charge is made for each arm tested and they require two tests; one very severe for the unfinished arm, the second for the finished product. This costs about 12

cents per arm and is borne by the manufacturer or must be added to the cost of the goods.

On firearms imported into Great Britain, which are subject to the two tests, the strain is severe, especially on shotguns, as the first test given the English guns in the rough is given the American finished product and after the barrel is turned down many of the finished guns will not stand the test, neither would the finished English guns stand this first test.

American rifles invariably stand both tests, but it adds materially to the cost to be obliged to have all firearms, after being received by the English dealer, unpacked, tested and then repacked and returned. This could be done much cheaper at home, besides it would give the American product a reputation abroad that could not otherwise be obtained.

But the greatest benefit would be to the users of the firearms in our own country. They would be protected against defective goods sent into this country by foreign manufacturers, which will not stand the proof house test, and would also be insured against inferior goods of home manufacture. This applies especially to the lower priced goods that reach a class of people who are not expert or competent to judge of quality.

There is now at the United States Armory at Springfield, Mass., a proof house for the testing of Government rifles made there and this could be enlarged and used as the Birmingham Proof House, and by making a cost charge for the testing it would not be an expense to this Government and at the same time would be a protection to the people of the United States, the same as established by other governments. This the Government will do sooner or later.

If every user of firearms will take this subject up with the senators, representatives or army officers of his acquaintance it would result in the prompt enactment of laws for the protection of the American people and the American manufacturer. ARMS.

Lake Iron Ore Matters.

DULUTH, MINN., June 6, 1903.—May shipments from all upper lake ports, except Escanaba, were 2,969,435 gross tons, and for the season to June were 3,593,035 tons. This latter compares with 3,980,450 for the corresponding period last year, with 1,046,900 in 1901, with 2,613,320 in 1900, with 1,455,888 in 1899, and with 1,629,090 in 1898. The slight decrease to date from last year is not as much as the shorter season would excuse, and shows a greater movement since it began. Since Minnesota shipments to June are actually larger by 140,000 tons than a year ago, it follows that older ranges are showing a decrease that the Mesaba is more than making up. The figures for Escanaba show about the same relatively as those from other ports. Most mining people and railway men are of the opinion that the season will not come up to earlier anticipations, and that total shipments will scarcely exceed those of last year. It was hoped by Great Northern officials, for instance, that total movement over that road would be about 6,000,000 tons, while now Mr. Hill looks for quite a little less. Eastern strikes and a delay in ore purchases are contributing to the uncertainty. Ore sellers look for greater buying activity later in the year, but if this is delayed until fall it may come too late for some shippers, who cannot then respond to a sudden and larger call than they have had reason to expect.

Owing to large traffic in ore and coal the lakes are showing a bigger business than ever, and May exceeded all previous months in Sault canal records, with a total freight movement of 5,188,017 net tons. The largest months are usually July and August, and in August of last year all preceding records were broken by a total of 5,070,491 tons. So far this year 21,000,000 bushels of grain have passed the canal, 1,350,000 barrels of flour and 1,642,000 tons of coal. To date 18,890 tons of copper have passed out of the lake by water, which is less than during the same periods of 1896, 1897, 1898 and 1900, considerably less than during some of these years. This is probably due to the continuance of rail shipments to the very opening of lake navigation, for production was never at so high a point as now.

The Illinois Mining Company (Deering Harvester Company) have closed their option on ten 40-acre tracts at North Freedom, Wis., and have paid $30,000 advance royalties to Whiteside & La Rue of Duluth, the owners. The company will commence active mining operations as soon as possible. The royalties on this ore run from 15 to 30 cents, acording to grades, and the minimums amount to 20,000 tons on the entire tract. The company have more than 2,000,000 tons of ore in sight, in a lense 100 feet wide, of which 40 feet is very high grade Bessemer, the balance fair shipping quality. This ore lies at depths varying from 100 to 300 feet, and is being opened by shafts. The Wisconsin Mining Company of Baraboo, the Iroquois Iron Company of Chicago, the Flewelling Development Company, who are a Milwaukee road concern, and others are in the field, the former three with large showings and with a very considerable tonnage in sight. But the only concern that have actually taken out any ore or opened into their lenses on a large scale are the Deerings.

The Mass Shaft.

The now noted Mass shaft of the Cleveland Cliffs Company at Negaunee has at last struck ledge and is fixed there. This shaft has been sinking through quicksand and clay seams since February 10, 1902, and is now resting at the depth of 160.7 feet. The greater portion of the shaft has been sunk with pumps, and from 1000 gallons to much more has been lifted per minute, nearly 1,000,000,000 gallons having been handled during the progress of work. At about 120 feet from surface, 40 feet from bottom, a bed of clay 30 feet thick was struck. This acted as a dam for the water in the area in which the shaft is located, and frequently this dam would give way, letting great volumes of water up into the shaft. A vast circular pit has been formed about the shaft, as sand has run down with the water, to be lifted out by pumps; this sand is very fine, with the consistency of flour, and was a remarkably treacherous quicksand. With the shaft ledged at 160 feet in slates, the resumption of sinking will be undertaken as soon as its walls are straightened; these are naturally somewhat out of line now, and 600 feet remain to be driven down before drifting on the ore can commence. It will be, therefore, at least a year more before any ore is taken out of this great operation. A fine mine will at length be opened in this property, which has been a very costly proposition to date.

At the work in Swanzey, undertaken some little time ago by the Cleveland Cliffs Company, the shaft is now down more than 100 feet. Levels will be run later this year and some experimental shipments may be made this year, though actual mining will not be undertaken before 1904. In the rest of the district, which has been taken up by prospectors with a wild boom, little of encouraging nature is yet found. Claims are, however, held at thousands of dollars, and hundreds of claim holders are figuring their future wealth already.

The same company have taken an option on the old Ogden mine, 3 miles from Negaunee, and are pumping it. It has been idle for 35 years. It contains a lean ore that can be utilized at the Marquette furnace. The Cleveland Cliffs Company will also resume work at their old Foster mine in the same vicinity.

A large shaft is to be sunk by the Oliver Iron Mining Company on land adjoining the Bonnie mine, at Ironwood, Gogebic range. It will be four-compartment and will go down 1000 feet vertically to reach ore.

Volunteer mine, at Palmer, is being worked steadily by the Oliver Company, who fell heirs to it through the purchase of the Union Steel Company. Nothing will be shipped till the large crusher at Escanaba is ready, for this ore requires treatment. A considerable tonnage will be shipped this year.

At the Armenia, of Corrigan, McKinney & Co., where work was suspended last week, operations have been recommenced and some ore is to be hoisted. It is announced that "sales have been made since the suspension, and that tonnage to fill them will be taken out." There are some 20,000 tons on surface that are to be shipped out immediately also. At Crystal Falls explo-

rations are under way by the Illinois Mining Company, and indications are quite good. It is supposed to connect up with Tobin. At Great Western, Crystal Falls, Lamong, Tobin and Dunn mines of Corrigan, McKenney & Co. operations are continuing, and it is announced they are to remain active. County officers have put valuations of $1,080,000 on the mines of Crystal Falls district, aside from personalty. At Florence old No. 1 pit is being cleaned and 25,000 tons will be taken from it this year. All along the Menominee range there seems to be a famine of ore cars, though no one appears to know why.

Some weeks ago this correspondence stated that negotiations were under way for the rehabilitation of the old Nanaimo and Beta mines. These options have now been closed, for the Pewabic Mining Company, and pumping is, or soon will be, under way. The Nanaimo was among the original Iron River mines and shipped 128,000 tons before its final suspension. Extensive explorations will be continued at the Columbia in hope of finding new ore measures below the present bottom. There is not much hope of finding anything above, for it has been carefully explored and tested. D. E. W.

The Choice of Steam Boilers.

The following is taken from a paper by C. E. Stromeyer, chief engineer of the Manchester Steam Users' Association, read before the Civil and Mechanical Engineers' Society:

Forty years ago, my predecessor, Lavington Fletcher, evidently found himself in a somewhat similar position to mine; there were then in use many types of boilers, including water tube types, and there were also many different constructive details in one and the same type of boiler. Mr. Fletcher decided that, for most purposes, the Lancashire boiler was the most suitable, and he then carefully perfected its design. In our Manchester office is set up a full sized front end of a Lancashire boiler which he called the standard design. That design still holds the field, and, in England, though not on the Continent, it is to this day the recognized standard; the only modifications which have been made are that the two longitudinal stay bolts are not now fitted, and in high pressure boilers I have recently had to introduce a modification which, after three years' trial, can now be pronounced to be a satisfactory solution of the question of grooving in the end plates of Lancashire boilers. With high pressures these plates have now to be made very thick, up to, say, 1 inch, whereas 30 years ago they were rarely made more than ⅜ inch thick. Modern high pressure boiler end plates are therefore about 20 times more rigid than ancient ones. Most modern boilers are also heavily worked, and since condensing engines are more generally used there is, of course, much trouble with grease in boilers. Under these circumstances it was desirable to give relief by making modern high pressure boilers as elastic as the older low pressure ones, but without in any way weakening them. This has been effected by replacing 6 or 7 feet of the plain furnace flues by corrugated flues. Instead of fitting these at the furnace end, where—due to the fierce fire on one side and scale on the other, the corrugated flues suffer so severely that they crack—they have been fitted at the back ends of the boilers, and, as experience has shown, they are thoroughly efficient in preventing grooving around the surface fronts. The difference of cost between two 7-foot lengths of plain flanged furnaces and two equal lengths of corrugated furnaces is about £60.

The changed working conditions for boilers, notably the introduction of high pressures, have led to many novel types being placed on the market; their designs were not always as safe as could be desired, and during recent years it has occasionally been my duty to insist on increased strengths or modified designs. Thus, for instance, builders of locomotive types of boilers were in the habit of fitting girder stays which, according to the lowest standards, seemed excessively weak, and we have had to insist on increased scantlings, which now and then interfered with the internal accessibility. The very prolonged and apparently satisfactory experience of some boiler makers with girders which, according to mathematical formula, were only just capable of standing the test pressure, has had a very important influence on our decision not to ask for excessive strengths in these parts, for although, as guarantors of the safety of our members' boilers, we might be expected to consult only our own interests by insisting on excessive strengths, our position as consulting engineers to our members leads us to do our best for them in the way of safety, without running into unnecessary expenses for excessive weight of material.

As an old sea going engineer I cannot but help feeling favorably inclined toward the general marine type boiler having return tubes, for have not these boilers now been in use for many years without, as far as I am aware, a single failure? I am, of course, only speaking of those boilers of this type which are properly looked after. These boilers are less efficient than Lancashire boilers with economizers, but more efficient than Lancashire boilers alone; they are, however, expensive, being nearly twice as dear as Lancashire boilers of the same power, but they occupy only about half the floor space. It was, therefore, but natural that I should recommend this type where floor space was either not available or where it was very dear. A very serious difficulty soon presented itself. For inland towns it was found that the external dimensions had to be limited to 9 feet 3 inches in length and 11 feet in diameter, and even where the transport was only by sea and then by road, and where consequently these dimensions might be exceeded, one has to make preliminary inquiries as to whether the weight is not too great for the roads, or, rather, for sewers and gas and water pipes under the roads.

A modified form of the marine boiler is the dry back return tubular boiler. The heating surface lost by having no combustion chamber has to be provided for by additional tube heating surface, and the result is a boiler of about the same size, power for power, as the marine boiler, but weighing less. The brick work combustion chamber, however, occupies considerable floor space.

Water Tube Boilers.

Water tube boilers are difficult to deal with. To begin with, there are so many different ones. Leslie Robinson mentions 53 different types; many of these being, of course, designed to work at sea, would appear not to deserve our consideration, but that is a point of view which does not seem tenable, for the conditions at sea are certainly more arduous than ashore. It is true there is no scale in boilers on steamers as long as the condenser is tight; but then there is grease, which it is well known is worse than scale. Another difficulty as regards dealing with water tube boilers is that they are all monopolies, and whereas the patentees and their friends have an undoubted right, of which they avail themselves most freely, to mention all the good results which have been and can be got out of these boilers, outsiders would be exposing themselves to considerable risks if they were to mention defects which have come to their knowledge, unless such information had been obtained by a public committee or in a Board of Trade inquiry. It is not my intention to enlarge on these inquiries, and I will only remark generally that water tube boilers are unsuitable with sedimentary feed, and where the water is not pure these boilers should be accompanied by a water purifying apparatus, the cost for which should, of course, be added to that of the boiler. It seems also to be a general experience that water tube boilers have to be designed with more heating surface than ordinary ones. It is claimed for water tube boilers that they are fit for higher pressures than either Lancashire, marine or other boilers, but these behave perfectly satisfactorily up to a pressure of 200 pounds, a pressure which is already in excess of general requirements in factories, for it means steam pipes of wrought iron or steel and troublesome reducing valves, because many manufacturing processes require only low pressures. It is claimed for water tube boilers that they are quick steam raisers, but, strange to say, even in electric power stations, where this argument must carry much weight, we find only the relatively slow steam raising boilers—*i. e.*, those with large diameter tubes—whereas, the express boilers, with small

tubes, in which steam may safely be raised in 15 to 20 minutes, have apparently never been used. Those steam users who have been carried away by the argument of quick steam raising seem to have forgotten that no boiler responds more readily to sudden demands for steam than does the Lancashire boiler with its large water volume. Gradually this view is gaining ground, and in stations where water tube boilers are already installed large cylindrical water carrying vessels, called thermal storers, are being added. Another point to which patentees of water tube boilers are not likely to draw attention is that any boiler, but more particularly boilers with wide water spaces, can easily be made to raise steam quickly by providing artificial circulating arrangements, either pumps, as used at sea, which draw the cold water out of the boiler bottoms and deliver it above their furnaces, or else propellers in the boilers. In either case little power is required for circulation, and, then, of course, the speed of raising steam is limited only by the heat obtained in the furnaces. The objection to this arrangement is that it is not so simple as lighting fires and waiting; but seeing that a very large quantity of coal must be wasted during the long hours which are now considered necessary for raising steam, it is more than probable that the fitting of circulating appliances, combined with rapid raising of steam—say one hour in a marine boiler and two hours in a Lancashire boiler—would result in a saving of fuel.

Economy.

An important matter, and one which should not be overlooked when selecting a type of boiler, is that of general economy; but, unfortunately, the subject is such an intricate one that there is no time to do more than give a general summary.

There are two important heat losses from a boiler—radiation and heat carried up the chimney. Radiation is undoubtedly greater from water tube boilers than from marine or Lancashire boilers, partly because of the relatively larger radiating surface, partly because the bricks are at a white heat on the fire side, as against coverings of boilers being subjected only to the steam temperature. Assume that there is a constant loss of 5 per cent. of the full power heat supply, and suppose that a boiler is worked only eight hours out of the 24, then the loss by radiation is 15 per cent. of eight hours full power. At half power the radiation is 10 per cent., the total loss is 30 per cent. If, therefore, we make a continuous power test between two boilers we ought to deduct 10 per cent. from the mean efficiency in the one case and 20 per cent. in the other. The fairest boiler trials would be those carried out under the normal working conditions, and extending from the time the fires are lit to the time the fires are drawn.

The loss of heat up the chimney is intimately bound up with the efficiency of firing and the ratio of heating surface to water evaporated. The efficiency of the heating surface of a boiler—no account being taken of radiation—is found, without weighing the coal, by subtracting the temperature of the waste gases as they leave the flues from the initial flame temperature, as calculated from the ratio of carbon and hydrogen burnt and the amount of air contained in the gases, and dividing the difference by this initial temperature. Suppose that we are burning coke with a minimum admission of air, say 11.6 pounds per pound of carbon, then the initial flame temperature will be about 5000 degrees F., and suppose that the temperature of the escaping waste gases is 500 degrees F. above that of the ingoing air, then there is evidently a loss of 10 per cent. up the chimney. If, as frequently happens, the waste gases weigh 25 pounds per pound of carbon instead of 12.6, then clearly the initial temperature of the flame is reduced to 2500 degrees F., and if the waste gas temperature is again 500 degrees the loss up the chimney is 20 per cent. With smoky coal even more air is admitted, and we get losses of 30 and even 40 per cent., to which we have to add 5 to 10 per cent. for radiation, or 15 to 30 per cent. for 24 hours' trial, resulting in a total loss of 60 and perhaps 70 per cent.

These chimney losses can be reduced by efficient stoking and by reducing the temperature of the waste gases. This is done by providing much heating surface or by economizers. When these latter are fitted the question of excessive air admission is of relatively slight importance, for supposing that the economizer is of ample size, and reduces the temperature of the waste gases to, say, 400 degrees F., or, say, 340 degrees F. above the air temperature, then the chimney losses with 20 pounds and 30 pounds of air per pound of fuel are 11 and 17 per cent., the difference being only 6 per cent. When the waste gases have a temperature of, say, 740 degrees F. the losses are doubled, and the difference rises to 12 per cent. It is also found that the greater the excess of air supply the less efficient is the heating surface of a boiler, and it is safe to say that lightly worked boilers, having large heating surfaces—including economizers—may, without serious loss, be fired with a large excess of air; but hard worked boilers, if treated in a similar manner, will show a very serious economic loss, and whereas we may burn smoky coal in the one, supplying it, of course, with much air, the smaller boiler has to be fired with smokeless coal.

The above remarks would lead one to think that all we want at present is a furnace which, while giving a smokeless flame, requires no more air than the theoretical amount, but that it not so; there is one further condition, and it is a very important one—viz., the flame temperature should not be excessively high, as it leads to boiler troubles, such as bulged furnaces and burst water tubes, a subject with which I dealt last year at the Institution of Naval Architects. I have recently thrown out a suggestion to adopt double combustion, but seeing that this paper already exceeds the usual limits I will conclude by remarking that as matters stand at present Lancashire boilers with economizers are doubtless the most efficient as regards economy and upkeep, but they occupy much floor space. Marine boilers, of course, without economizers, are nearly as efficient, and seem to require practically no repairs; they occupy about half as much floor space as Lancashire boilers, but cost considerably more. "Economic" and water tube boilers are practically on a level as regards economy and floor space. In both cases the heavy brick work is a constant source of expense not incidental to the two other types, and water tube boilers have this additional disadvantage, that except when lightly worked with nonsedimentary and nongreasy water troubles are experienced with the tubes which, without counting the time wasted in stoppages, are a considerable expense.

The art of tempering copper for various purposes still possesses great attractions for some persons. The man who makes pocket knives and razors from "copper" (usually alloys of copper in all these cases) has been discovered again, but just what he is going to reap as a reward for his effort is not apparent. Copper, pure and simple, can be hardened so that it will "cut" woods and even metals, but hardening and tempering are two different propositions. In any event the comparative cost of copper and of steel would prevent the use of one in place of the other, so any process for the purpose indicated is of no value.

A conference between the Tin Plate Workers' Protective Association and the district managers of the American Tin Plate Company was held in the Carnegie Building on Tuesday, June 9. This organization represents tin house labor, and in the scale recently adopted at Anderson, Ind., some slight increases in wages were asked. It is probable that this scale for tin house labor will be settled this week.

The Manufacturers' Association at Pittsburgh held a special meeting on Monday, June 8, to discuss the boilermakers' scale. A number of conferences have been held between the manufacturers and the boilermakers since the strike was started, but these have been without result, and the boilermakers in the Pittsburgh district are still on strike.

The Erie Forge Company have been incorporated at Erie, Pa., with a capital of $150,000.

The Metallurgical Engineer in the Foundry.*

BY HENRY SOUTHER, HARTFORD, CONN.

A little money spent systematically for the services of a metallurgical engineer (not a chemist) pure and simple may save far greater sums. It is very much in the nature of an insurance against loss. Conditions may seem so favorable for months at a time possibly, materials may be received of such uniform and satisfactory quality, that money spent for expert services will appear to be wasted and therefore the plan is discontinued. Then suddenly may be received shipments of coke or iron, which had they entered the cupola would have ruined at least one day's product before discovery, and the loss would have paid an expert for some time. This is not an imaginary occurrence, but a real one, having come under my personal observation and into my hands as an expert several times—a matter of $1000 in money loss, friction with selling agents, legal expense in connection with settlement of bills and, greatest of all, damage to the reputation of the foundryman as a producer of uniformly good iron.

I have excepted the chemist from this argument, and will show my reason for so doing. A good chemist may be able to determine the amounts of the various elements in irons or fuels to the third decimal to the minimum limit of chemical error. He may be quick and do a large number of determinations per day. But of what use are results without practical interpretation and application? A chemist may become the best kind of a metallurgist, but only by personal contact with metallurgical operations in every detail and in several branches. A good share of common sense is a most valuable and necessary adjunct. A metallurgist need not be a chemist, but he must know how to use a chemist and the results obtained by the chemist. The chemist is an absolute necessity to the metallurgist.

The steel industry is the most marked example of an industry thriving under the care of expert metallurgists assisted by chemists. The two are rarely united in one person, each being busy in his own field.

Rule of thumb methods gave way to exact methods about 1870 in the iron and steel industry to a marked degree. Blast furnace practice, from being a hazardous, uncertain process full of difficulties, became a process of certainty with the advent of technical knowledge, all because the furnaceman with his secrets gave way to the metallurgist and his open and exact methods, subject to the inspection of all concerned. Then, of course, these same methods grew with the then infant steel industry and became an essential part of the industry. That which is common practice now would not be possible at all without the chemist to analyze under the direction of the metallurgist and with his interpretation of results.

It is no longer necessary for a foundry, large or small, to employ the exclusive services of a metallurgist. One may be found in nearly all the large manufacturing centers of the East or West who is at the service of the general foundry trade on very reasonable terms. As a rule, these experts have their own chemical and physical laboratories; a necessity in nearly every problem under their investigation. One without the other is helpless. As a matter of fact, the chemist without that practical training and experience to which I so strongly refer has blocked and retarded the advance of the use of expert knowledge into the foundry trade more than any one other element.

Every analysis the metallurgist should ask for ought to count in getting at results. What a lot of good time and acid is wasted in determining the amount of graphitic carbon in pig iron for cupola work. The total carbon is the only vital carbon result worth consideration in connection with iron to be used for melting. The amount of graphite is a measure of the time of cooling of the iron in which it exists. It depends on the initial heat of the molten iron; on the character of the mold in which it was cast, whether dry sand, wet sand or an iron mold, and on the volume of the casting. It may be varied at will by varied speeds of cooling, and, to conclude, all carbon returns to the same conditions when melted, regardless of its condition when solid. It is instructive in a finished product, because it so strongly influences the physical characteristics of cast iron, but valueless in pig iron for melting purposes. I mention this, as I know it to be one of the most marked examples of wasted effort in foundry chemistry. The iron agents dote on graphitic carbon. They would rather talk graphitic carbon to a prospective purchaser and thereby throw glamour and mystery over their iron than eat.

This is only one example of misdirected effort, and by this and many others the chemist pure and simple has caused many foundrymen to condemn all chemical work and set all expert knowledge down as useless. Another practice is having the same effect. The foundry manager who buys chemical results at a few cents each soon accumulates sheets of them; most are useless because he has not the necessary knowledge of metallurgy to get much out of them. Then he buys books on cupola practice; some of them good books, others inaccurate and misleading, at any rate contradictory. He is stuck, and finally concludes the experts do not know anything any way. Why? Because he has not employed a good one, and because all that is printed in books is not gospel truth about foundry practice any more than about anything else.

One writer advocates physical tests only, another chemical tests only, another no tests at all, and so on. As a matter of fact, each kind of test is most instructive in its own particular field and an intelligent use of all kinds is the best practice. The thoroughly practical metallurgical engineer is the one that uses any one or all as the case demands, and thereby gets the best results.

Now it has been thought that the small foundryman has less use for expert knowledge than the large one. I find the contrary to be true. Of the two the small producer is liable to the greater irregularities of product. His cost charge for expert service will be greater per ton, all other things being equal, but not heavy even at that in consideration of possible benefits and savings and the small tonnage.

Sentiment, rule of thumb methods, fancy prices for "special" irons and doses of medicine for a steady diet have to yield to facts, systematic methods, iron prices based on quality and an open and above board cupola mixture with no mystery about it. Many may think such bad conditions as I have mentioned are back numbers, that they do not exist. I can state positively such conditions in the small foundry are the rule rather than the exception, and even in many large foundries where modern methods have not been heard of. There are many foundrymen that think that if a pig iron bears a certain brand it must be exactly like every pig with the same brand. They do not know that a given brand may vary between very wide limits and cause them as much variation as though they were working with several brands.

There is a feeling among many foundrymen that the employment of a metallurgical engineer will result in great friction with the iron dealers, because of the probable fussy demands of the engineer. I want to state an exactly opposite view. The intelligent engineer knows exactly what to ask for, and exactly what may be had in the market at ordinary prices. He puts before his employer the simplest possible specification that will bring him the kind of pig iron he wants. The limits may be very wide, and still give uniform castings for a product with intelligent mixing of several irons. When such an iron is received by the foundry and is found to be within the reasonable limits specified, then there can be no more question between buyer and seller. The responsibility rests on the engineer who specified it.

On the other hand a very confused state of affairs is often found. The foundryman orders Excelsior brand No. 1 pig iron like the last he had. It arrives, and the first day he puts it into his cupola he may get a lot of dirty castings or something else abnormal. He does the natural and obvious thing on the face of it, and lays the

* Abstract of a paper read before the American Foundrymen's Association, Milwaukee, Wis., June 9 to 11, 1903.

trouble to this new shipment of pig iron in the absence of accurate information. He then promptly writes a letter of protest to the furnisher of the iron and perhaps refuses to take it if the difficulty has been a very serious one. Then follows a long dispute, further trials of the iron, dissatisfaction between buyer and seller, and after all it may never have been the iron in question that caused the trouble.

OBITUARY.

CHARLES D. ROGERS.

Charles D. Rogers of the Rogers Screw Company, Providence, R. I., died on May 26 at his residence of tuberculosis. Charles D. Rogers was the son of Oliver Glason Rogers and Deborah (Lewis) Rogers. He was born July 15, 1827, in Willowvale, New Hartford, N. Y. The education acquired by him in the schools of Oneida County, together with the practical knowledge gained by working in the factory and machine shops of his father, fitted him for the mechanical pursuits which he had since successfully followed. Until his forty-third year he had been either manager or partner, or both, in several manufacturing establishments, and especially in screw companies who were afterward merged into the American Screw Company of Providence, of whom he was general superintendent and a director from 1870 until his resignation in 1899, when he became actively interested in the Rogers Screw Company of Providence, now in successful operation and utilizing the improvements which he devised. His extensive experience, gained by long connection with these companies, and his rare inventive genius enabled him to greatly improve old methods and invent many valuable machines. Among the most important of the latter may be noted the machinery for making wood screws by the so-called forging process, on which he had secured many patents. He overcame the difficulties previously encountered in forming wood screw threads by making a rolling die. Mr. Rogers' two sons are connected with the screw industry, Charles L. Rogers being superintendent of the British Screw Company at Leeds, England, and Henry R. Rogers superintendent of the Rogers Screw Company of Providence.

PROF. J. PETER LESLEY.

Prof. J. Peter Lesley, the eminent geologist, died at his home in Milton, Mass., on June 1, aged 83 years. He was born in Philadelphia on September 17, 1819, and was graduated from the University of Pennsylvania in 1838. He studied at Princeton Theological Seminary and in 1844 was licensed to preach by the Presbytery of Philadelphia. After several years more of study he became pastor of the Congregational Church at Milton, serving from 1848 to 1851. Then his views on theological matters changed and he left the ministry. He was the first secretary of the American Iron Association, now the American Iron and Steel Association, Philadelphia, organized in 1855. While secretary he made an exhaustive inquiry into the character and resources of the iron works of the country, personally visiting the great majority of them. This was a formidable undertaking in those days of limited railroad facilities, as there were no large works concentrated in cities, but the iron produced in this country was mainly made in small charcoal furnaces, of which there were several hundred scattered over forests from Maine to Georgia and as far west as Missouri. The rolling mills were also numerous, but small and similarly scattered. He was professor of geology and mining and dean of the scientific faculty of the University of Pennsylvania from 1872 to 1878, and since 1886 had been professor emeritus at that institution. He was chief geologist in charge of the complete survey of Pennsylvania, which was begun in 1874, and had made extensive research in the coal, oil and iron fields of the United States and Canada. He leaves a widow and two daughters.

NOTES.

FREDERICK R. HARRIS, formerly of Youngstown, Ohio, died May 29 at Princeton, Ill., of Bright's disease. He was well known in the iron trade in the Pittsburgh district, having been connected with the firm of Homer Hamilton & Co., out of whom grew the William Tod Company of Pittsburgh. Mr. Harris was for some time superintendent of the Pepper mill of the Union Iron & Steel Company, and subsequently acted as superintendent of the mills of the Falcon Iron & Nail Company at Niles, Ohio. Later he went to Los Angeles, Cal., to establish a sheet mill, which did not prove a success, and he returned East to become connected with the Corning Sheet Mill at Hammond, Ind., which was bought by the American Sheet Steel Company. For the past few years Mr. Harris had withdrawn from active business on account of the failure of his health.

HENRY A. CALLAN, Western representative of the Latrobe Steel Company, died May 31 at his home in Chicago.

JOSEPH HAIGHT, superintendent of the Pemberwick factories of the Russell, Birdsall & Ward Bolt & Nut Corporation of Port Chester, N. Y., died on June 6 from heart disease at the home of his son at Oakland Beach, aged 76 years. Mr. Haight entered the business department of the corporation 45 years ago and for 30 years had filled the office of superintendent.

JOSHUA EVERED, president of the National Iron Company of West Duluth, Minn., died May 29 at his home in that city from heart disease, at the age of 59 years. Mr. Evered was a prominent citizen of Duluth, where he settled 22 years ago, coming from Muskegon, Mich. He established the National Iron Works in 1896.

GEN. WILLIAM PATTON, who died on June 5 at his home in Columbus, Pa., aged 87 years, was for many years engaged in the iron manufacturing industry at that place. He was also a pioneer railroad builder, having constructed the greater part of the Huntington & Broad Top and Philadelphia & Erie roads.

The Hyle Steel Tool Plant.—The Hyle Steel Tool Company of Syracuse, N. Y., have purchased a 2½-acre site on Greenway avenue, adjacent to the New York Central Railroad, where they will erect a plant for the manufacture of steel tools under a secret process. The general plans call for a main building, 40 x 140 feet, part two stories, which will be occupied by the offices, pattern rooms and finishing department; foundry, 60 x 100 feet; furnace and annealing buildings, 30 x 60 feet each, and a building for cleaning castings. The buildings will be of steel and brick with cement floors. Work of construction will be started as soon as possible, and it is expected that the plant will be in operation by fall. The equipment will be modern throughout and will include about 12 polishers, 100 grinders, milling machines and lathes, none of which have been purchased. Power will be furnished by a 100 horse-power engine and a 125 horse-power boiler. When the plant is in running order it is the intention of the company to build an addition for the manufacture of bar steel. The officers are: Peter Eckel, president; C. K. Underwood, vice-president; Charles M. Bedell, secretary; W. H. Clarke, treasurer, and Charles C. Warren, assistant secretary.

Chas. G. Smith Company, 347 Fifth avenue, Pittsburgh, are now representing the Bullard Machine Tool Company of Bridgeport, Conn., on a line of boring mills, turret machines, &c. The same concern also represent P. Blaisdell & Co. of Worcester, Mass., on a line of drill presses.

H. S. Green and E. A. Smith of Morrison, Ill., are interested in a project for developing the water power of Rock River at Lyndon. Plans for the plant are being prepared. About fourteen 150 horse-power turbines and 1800 horse-power of multiphase generators will be installed. The cost is estimated at $150,000.

The Kansas City Railway & Light Company have been organized to consolidate the street railway and lighting interests of Kansas City. The capital stock is $25,000,000. Chicago capitalists are prominently interested in the deal.

The American Foundrymen's Association.

EIGHTH ANNUAL MEETING.

The eighth annual convention of the American Foundrymen's Association opened its first session at 10.30 Tuesday morning in the club room of the Hotel Pfister, Milwaukee, Wis. The attendance was excellent, being fully up to the average of the annual meetings of the association in recent years. President A. W. Walker of the Walker & Pratt Mfg. Company, Boston, opened the proceedings by calling upon William Turner of the Wisconsin Malleable & Gray Iron Mfg. Company, the vice-president of the Milwaukee Foundrymen's Association, who extended a hearty welcome on behalf of the foundrymen of Milwaukee. The city has over 40 foundries, among which are some of the largest in the country. Mr. Turner made an eloquent address, which was received with warm approval. He introduced Mayor David S. Rose, who spoke for the city, expressing his pleasure at meeting the representatives of so important a branch of business as the foundry trade. It was very appropriate to make Milwaukee the place for holding a convention of this character, as the value of the iron products manufactured in the city last year was $80,000,000. He paid high tribute to the character of the workmen of Milwaukee, who largely possess their own homes, which makes them order loving and conservative. Strikes are of infrequent occurrence, but when they occur the population is not disorderly. He hoped the deliberations of the convention would be profitable, and that all present would carry away pleasant recollections of their visit. Willis Brown of Erie, Pa., responded in behalf of the association, making a speech full of humor and expressing in the happiest terms the satisfaction felt by the members of the association with the warmth of welcome which they had received. President Walker followed with appropriate remarks, which very gracefully terminated this part of the programme.

President Walker delivered the following address:

Address of the President.

FOUNDRY FOREMEN'S AND METALLURGISTS' SECTIONS.

The most important change within the association during the year is the establishment of a section for foundry foremen, and also a section for foundry metallurgists. The former was created in response to a request from the association of foundry foremen now existing, who desired to affiliate with us, from an educational standpoint, which is theirs also. The negotiations which were authorized at the convention in Boston were afterward concluded, and were quite simple in character. It was shown by the constitution of the Foremen's Association that their object was purely one of mutual benefit through educational method. Your Executive Board therefore placed them upon the same basis as the local foundrymen's associations now affiliated with us, as to annual dues. It was further agreed, inasmuch as the volume of the convention business warranted its subdivision into sections, that questions and papers relating to the practical operation of the foundry be delegated to the foremen's section, they having charge of one session of the convention, for this purpose. A chairman and secretary were appointed to carry this out efficiently. Similar action was taken with respect to the metallurgical questions now so frequently arising. A section for foundry metallurgists, authorized by the association at its last convention, has been duly established, and a chairman and secretary appointed.

It was agreed that all matters coming up at the sections, as well as in the associations affiliated with us, would be published in our *Journal*, if of interest to the association at large.

OTHER CONTEMPLATED ASSOCIATION WORK.

It is further agreed, in view of the demand generally expressed, that steps be taken to organize sections for pattern foremen and for foundry accountants, both of these branches of office and work management offering lines of standardization which would be of marked value to the industry in effecting economies.

Something might be done for our apprentices in the way of education in their trade when they cannot avail themselves of schools or correspondence schools. If it were possible for foundrymen to obtain short instruction papers from our association on subjects related to their work, for distribution among apprentices and men, it is probable that interest would be created; and many of the younger men could enter the present correspondence schools, or the hoped for trade school for molders. The members of the association might receive great benefit from such a course.

TRADE CONDITIONS.

Regarding the condition of the trade from a business point of view, we have passed through a year of extremely high values. No one can be sure whether this period will long continue. Prices for coke appear to have receded permanently and values of pig iron are somewhat lower, with a tendency slightly downward.

We have passed through the difficulties of a rapidly rising market. I hope we shall not experience the trials of a rapidly falling market, which is, in my belief, even more difficult for the manufacturer. It requires high ability to manage a business with satisfactory profit while prices are falling. I suppose we would all prefer that, a high level as to costs having been reached, present conditions might continue indefinitely. Let us then hope that such may be the case, but it does not seem possible that such hopes will be realized. Perhaps the best we can expect is that the fall in values may be uniformly distributed over a long period.

THE LABOR PROBLEM.

I believe it appropriate also to refer to our relations to those employed by us, commonly known as the "labor problem." This subject is prominent in many foundries and will require our best thought and judgment for some time to come.

From the earlier methods of dealing with labor, we have developed the condition of the present, which may be described as one of better organization on both sides. Some of the unions have become national in extent. Many employers are also affiliated in associations for united action and defense. Each side has a large fund to give support to any course it may determine upon. Such reserve power tends to make both sides reasonable. We have gained in experience, and better understand the fair and equitable settlement of business problems by the application of common sense. In our industry this is the state of things to-day. Many prominent employers believe we have attained the ideal relation between capital and labor. We have certainly improved upon earlier conditions, and yet from a certain point of view these present methods are but a step forward and do not reach the final ideal. We may therefore expect to modify or abandon them later.

The present situation in our trade—a powerful labor organization on one side, and no less powerful associations for defense on the other—is similar to that of the nations of the world, with respect to their naval armament. As strong navies are a guarantee to continued peace, so large and constantly increasing funds available for instant use by these strong organizations may insure industrial quiet. But great military and naval strength, while doubtless the most practicable peace maker now, will in some period be obsolete for that purpose. As the increasing effectiveness of modern weapons makes war absurd, unreasonable, and finally impossible, so large reserve funds may in time cease to be the chief reliance in dealing with labor. If, then, our present ways of dealing with this subject seem to fall short of the ideal, what methods will in time replace them? We

cannot expect past or present notions to suit the new and ever broadening future, in this or in any other department of our business.

I do not assume to have the gift of prophecy, not to be more enlightened than other men, but I beg to offer a few suggestions which may indicate the probable future trend of thought and action in dealing with the labor problem.

COMMON SENSE NECESSARY IN HANDLING LABOR.

In the first place, then, we must have the same common sense and progressive spirit in handling labor as in the development of new processes. We cannot expect present methods of manufacture to long continue, neither can we hope that the present manner of dealing with labor will remain satisfactory during the next 10 or 20 years.

Neither can we expect in this country to permanently withhold from our workmen a fair proportion of income from manufacturing enterprises. Nor can we hope to crush labor unions, or by large defense funds to settle finally the economic questions involved. The manufacturer who is wisely building for the future will study to work with his employees rather than against them, to please them; to unite his managing ability with their muscle and skill. If new methods of dealing with labor problems are to be in this direction, it may require a change of heart on the part of many.

The health and comfort of workmen in the shop is a matter so old it is hardly necessary to refer to it. We cannot expect a workman who is uncomfortable, and trying to perform a difficult operation without sufficient light, or air, or adequate appliances, to be in a frame of mind suitable for working wholly in his employer's interest. For some, therefore, a first step in the establishment of cordial relations between employer and workmen may be to study the comfort and convenience of employees. This is, however, only the first step; others will be clear to any employer who approaches the subject with an honest desire to do what he can.

We shall come to understand in the future that a manufacturer should be willing to pay the highest wages that the state of his industry will permit. His workmen are his partners; why should their welfare not concern him even more than that of his customers?

It may be well to inform employees relative to the business details of any enterprise. When a factory is busy, they expect enormous profits. They do not understand nor consider the relation of cost to selling prices. They cannot know whether orders are filled at a loss, were various expenses considered. If such information could be given it would make men more reasonable in their requests. An easily raised objection is the tendency of such a course to advance wages in prosperous times, but the liberal minded manufacturer will not object to this. When dull times return, the men must expect the inevitable reduction of wages; if they are entirely satisfied that they are based upon the true state of the business, they will accept such reductions with content. The manufacturer must be honest with his men, and his men will be honest and fair with him. The American mechanic wants to be treated squarely. If he is sure of this he is willing to share with his employer the burden of dull times.

I am not saying that the earnings of the men should be in direct proportion to the profits of the employer, but earnings do and should bear some relation to profits. Many contests have arisen over this matter, some due to insufficient information, or an unreasonable concealment of real conditions by the employer.

I believe in the good sense and fair intent of any body of American mechanics when they are squarely met in an honest, straightforward and business like manner on any question with which they can be made familiar, and questions of market conditions, costs, selling expenses and profit are not complicated, although they may be made to appear so. They can be stripped of all complications, and any employer who is fit to continue in business can present them to his workmen in a form easily understood. If we would give as much time and thought to informing and educating our employees as we now spend in trying to please our customers, the effect would, I think, be helpful.

Sometimes an employer may go so far in prosperous times as to distribute a portion of his profits among his men. But it is not entirely a question of money with the American mechanic. The rapid development of business has separated him from his former contact with his employer; his imperfect notion of profits and similar matters has made him discontented.

THE LABOR AGITATOR A LOGICAL PRODUCT OF THE TIME.

The professional labor agitator is a logical product of the time; employers should make him unnecessary, and we shall hear no more of him. There is a reasonable and proper place for the real labor leader; one who by nature and education is fitted to counsel, advise and conciliate; who is honest, sincere and always fair; who understands business and the position of business men. This ideal labor leader, as I have described him, is a more highly idealized product of civilization than the average employer of the present time. It is expecting too much that he should materialize at once; but in time he should appear, and I believe will do so. Employers should first themselves show him the pattern in the conduct of their own business. Neither the laboring man nor his representative can be expected to advance in these matters until employers have advanced first.

I believe that there are manufacturers who are studying closely this way of dealing with labor, and are making progress along these general lines. They are not saying very much about it, and are not quite sure whether they can make a success of it. Some of them will doubtless fail to reach their ideal, and all of them will be disappointed at times; but in this, as in other matters, no honest and earnest effort entirely fails. All of us who deal with employees must expect frequently to be misunderstood and possibly abused for trying to get into closer relations with them. It must also be admitted that some of our theories and attempts in this direction have been mistakes.

It seems to me almost if not quite true that the manufacturers who will achieve the highest development and success during the next 10 or 20 years will be those who recognize the present conditions as temporary, and put themselves in line for permanent harmonious and cordial relations with the men who are doing for them in factory or foundry the work which they themselves would do if the size of their enterprise would permit.

With a face turned toward the bright future, and a heart full of hope, I look for that new and enlightened relationship upon which we may soon enter; a better feeling between employer and employee, a relationship most cordial, a spirit of mutual helpfulness; the prevalence of common sense and mutual forbearance. The manufacturer with a hundred or a thousand men associated with him in the production of any kind of goods, all working harmoniously together, with intelligent united effort, and with a sincere desire of all—the owner, the lowest workman and all the men between—to bear a full share of responsibility, and put forth the greatest effort for the common good, is an industrial combination which will stand against the world.

In connection with his address, he showed a large diagram, on which he had plotted the course of pig iron prices for last year and the opening months of the present year, to which he referred, and stated that he would be glad if any one present would kindly finish the plotting of the diagram for the remainder of this year.

Secretary Moldenke presented his report, as follows:

Report of the Secretary.

It will be generally conceded that the supreme rush in our business is now over. The high point has been passed, but we have yet before us a period of steady production at fair prices. It is but natural that the coming few years will bring forth many changes in methods of running our foundries, and this feeling has been very freely reflected from the general correspondence of this office. A marked interest is taken in "continuous running" of foundries, information has been called for, advice wanted, the pros and cons argued out, all of which shows that

the running of foundries night and day, and pouring continuously, may not be so far off as is sometimes imagined. It is realized that while our foundries are now able to handle the work offered them, and that for some time to come they will probably be run below their full capacity, yet when the next great wave of prosperity arrives the question will rather be one of utilizing the plant capacity to the utmost than making enlargements. It will therefore be well to ventilate this question of continuous running very thoroughly, and thus in a way prepare our membership with the necessary information in good time.

It is further generally conceded that only in educating our present and coming labor will we overcome the evils that are steadily growing and hampering the fullest development of the industry. We need better apprentices and more of them; better informed molders and more of them; better machine hands, better pattern makers, better core makers, better foremen—in fact, we want highly paid and valuable specialists, so to speak, in every corner of the foundry. In this way we will increase the net gain for the yearly turnover, and not only produce better work but make life more worth living.

To do this we must begin at the bottom. We must furnish the apprentice the means to acquire the information that is to be the foundation of his life work. The correspondence schools are doing excellent work in this direction, but not every boy can avail himself of this opportunity. How many of our boys in the foundry and girls in the core room must help to support the family, and cannot therefore acquire an education, even if they desired it. Then again, it is far better that the foreman, who must be a natural teacher to be of full value to his employers, give the apprentice his first rudiments of the molding art. After this, and when the boy may be earning better wages, the correspondence schools will be valuable adjuncts in his career.

I would therefore recommend that short and elementary instruction papers be prepared under the direction of a special committee, and issued by this association to our foundrymen at cost, for distribution among the employees in the foundry. The information thus disseminated would prove valuable in time. I saw an instance of this nature this winter which demonstrated the good that can come from such a labor of love. Apprentices, molders and even clerks from the office eagerly absorbed the information thus given by the foreman of a large foundry in the East. Not a Sunday (on which important repairs were made) passed without finding the students all engaged in noting cupola and other repairs, and lending a hand just for the experience it taught them, not to speak of the alertness of every one to note mistakes that might be made by the men in the ordinary shop routine. Here was an ideal situation—a corps of men that could be drawn upon and depended upon in emergencies, and all willing to assist the company as part of their system of education. I may add that every one of these students is striving to become at least a foreman. Were every foundry thus constituted we would not hear of strikes, and ordinary business capacity on the part of the management would not find it difficult to keep the shop full at all times, even at the expense of the rest of the world.

The third point I desire to bring up is the recommendation of our fellow member, Stanley G. Flagg, Jr., who urges the association to do something in the way of original investigation for the purpose of overcoming difficulties in foundry practice. If this be not possible, then to encourage others in doing so, by advice and financial aid. The recent endowments by Mr. Carnegie along just these lines, though more naturally for the wider field of steel, may serve as an example. We might therefore get in touch with the universities, where young men are preparing themselves for a life career and would be only too glad to work on problems which have substantial after results in a commercial way. The materials necessary would have to be furnished, and constant advice and conference with a special committee of our association would constitute our end of it. It would therefore be well to go into this question also, and see if something cannot be done of permanent value to the foundry industry.

An unusual amount of interest has been directed to the study of cast iron during the year, the direct consequence of which was the appointment of a representative committee of producers and users of cast iron. The purpose of this committee is to draw up standard specifications for testing cast iron and finished castings. This committee of 68 members, appointed jointly by the International and the American Societies for Testing Materials, finds our association well represented. Work is being pushed along rapidly, and the results of our own investigations will be freely drawn upon. The full significance of this departure cannot yet be fairly gauged, but it really means that cast iron has been advanced into that class of our industries which may be termed the more exact. The haphazard methods of the past are being relegated to the rear, and science and practice are combined to hold the field for much of our work formerly in great danger of drifting into the malleable and steel casting plants.

Turning now to our own affairs, we can chronicle a most active and successful year. Thanks to the generosity of the New England Foundrymen's Association, who donated $425 to our treasury, to the proceeds of the Standardizing Bureau, which gave us a profit of over $350, and finally to the Philadelphia Foundrymen's Association, who voted $100 to us to cover subscriptions to the *Journal* for its members, we can report an unusually large amout of literature distributed, all bills paid, and a balance of $58.05 in the treasury. The income for the year was $3175.52 and the expenses $3117.47.

Our members and subscribers now number 317, and the indications point to a more rapid growth, due to the recent establishment of special sections within the association, to facilitate the transaction of special lines of work. Much is expected from the new sections for foundry foremen and for the metallurgists. In the case of the latter there has now been created a common ground for furnace and foundry. This has been quickly recognized, and we already count in our membership many furnace managers and members of their official families. The work of these sections will best speak for itself.

Treasurer Willis Brown read his report, which, in brief, showed the following results:

Received from the treasurer last year, $1.37; receipts this year, $3175.52; total income, $3176.89; expenditures, $3117.47; balance in treasury, $59.42.

This shows a very satisfactory condition of the finances of the association, as all debts have been paid and the income is now in excess of the expenses.

Thomas D. West of Sharpsville, Pa., chairman of the Committee on Standardizing Bureau, presented his report on standard drillings, which continue to grow in favor, their use having extended abroad. A complimentary letter referring to them was read from the superintendent of the chemical laboratory of the Nicopol-Mariopol Mining & Metallurgical Company, Russia.

The secretary read the reports of the Committee on Methods of Determining Constituents of Cast Iron, of the Committee on Sampling Cast Iron and of the Committee on Proper Valuation of Pig Iron for Foundry Purposes. All these reports were received without action or discussion. The chairman of Committee on Insuring Patterns was absent, and Secretary Moldenke read his report, also giving an extended explanation of the peculiar features governing payment for patterns destroyed by fire and the necessity of having a proper basis for arriving at their value for insurance purposes.

Insuring Patterns.

F. Conlin of South Bethlehem, Pa., chairman of the Committee on Insuring Patterns, presented a report stating that owing to the crowded condition of the foundry industry but little more than preliminary work could be done during the year. The committee was enlarged by the addition of the following names: C. J. Wolff, Chicago, Ill.; Thos. D. West, Sharpsville, Pa.; S. H. Stupakoff, Pittsburgh, Pa.; Richard Moldenke, New York. The insurance interests, as represented by the National Board of Underwriters, have been very cordial in their dealings.

with the committee, everything pointing to a complete and equitable solution of the problem, thus assuring the foundry on the one hand of more prompt adjustment in case of losses, and the insurance interest on the other a tangible basis upon which these adjustments can be properly and fairly made.

J. W. Seaman of Pittsburgh, chairman of Committee on Foundry Trade School, stated that he could only report progress. He had been relying on the school to be established in Pittsburgh under the donation by Andrew Carnegie. He said, "We have the money to buy the ground, also the money to build the school and the endowment to run it, but we have had all sorts of questions coming up to interfere with its progress." He hoped that everything would speedily be cleared up and the construction of the school begin.

Secretary Moldenke brought up the question of the preparation of instruction papers for the proper education of foundry apprentices. He thought it exceedingly desirable that the association should make provision for preparing papers of instruction to be furnished at cost to the apprentices and workmen in foundries, as a movement of this kind would be of great value in giving particular information of the kind so seriously needed. No action was taken.

A motion was adopted that a committee should be appointed to take up original investigation for the purpose of overcoming difficulties in foundry practice in accordance with a suggestion made by S. G. Flagg of Philadelphia. Mr. Flagg was designated as chairman of this committee, while the other members are to be appointed later.

Thos. D. West of Sharpsville, Pa., described a cupola slag conveyor built for his foundry by the C. O. Bartlett & Snow Company, Cleveland, Ohio. It consists of a bucket conveyor of the usual form operated on an incline, with the lower end placed below the cupola spout and the upper end extending outside the foundry, there dropping the slag into a car, cart or pipe, as desired. The use of such a device is unusual in a foundry, but was found necessary by Mr. West to dispose readily of the slag produced in the continuous melting of 20 to 22 tons of iron per hour, or about 500 tons daily. The quantity of slag runs from 19,000 to 25,000 pounds daily. A method of gathering the iron from the slag before it is dropped on the pile is contemplated. The slag contains shot iron up to 4 per cent. as well as oxide of iron up to 15 or 20 per cent.

Dr. Moldenke, in discussing this paper, said that in view of the fact that only about one foundry in 15 has a slag spout, this was a question well worth looking into. The convention adjourned.

TUESDAY AFTERNOON SESSION.

The president announced the appointment of a Committee on Nominations of Officers for the ensuing year, as follows:

Messrs. Yeagle of Pittsburgh, Magee of Boston, Golden of Columbus, Ga.; Baer of Milwaukee and Best of Montreal. He also appointed an Auditing Committee to audit the books of the association, consisting of Messrs. Seaman, Yeagle and Stupakoff, all of Pittsburgh.

The first paper of this session was read by Leon Gobeille of the Gobeille Pattern Company, Cleveland, Ohio, on

The Organization, Maintenance and Management of a Modern Pattern Shop.

This was much more than a paper, as Mr. Gobeille added many practical suggestions to the matter which he had prepared. He accompanied it with a sketch of a shop arranged for the employment of 25 pattern makers, and gave an ideal plan for the arrangement of the machines. He also showed a large number of photographs illustrating labor saving machines which he is using in his own shop. He advised foundrymen whose shops are near one another to combine in the establishment of a pattern shop to furnish patterns for all of them, stating that a combination of work of this character, which would enable it to be done on a larger scale and under systematic arrangements, would enable them to save half the cost of their patterns.

A vote of thanks was given to Mr. Gobeille for his paper and a discussion followed on the subject of pattern making, which brought out many interesting points.

President Walker then vacated the chair and turned the convention over to A. M. Louden of the J. B. & J. M. Cornell Company, Cold Spring, N. Y., the president of the Foremen's Section.

On taking the chair Mr. Louden made a short address on the position of foundry foremen and the necessity of their putting forth every effort for their mutual improvement, which was a matter that could be very materially advanced by an organization of this educational character.

Mechanical Device for Ascertaining the Average Silicon in an Iron Mixture.

President Walker described a mechanical device used in his foundry for ascertaining the average silicon in an iron mixture. It consists of a balanced scale, having a single beam on one side of the fulcrum and a number of beams on the other side. For the multiple scale beams small weights are used, each weight representing a certain kind of iron, and the weight being varied to represent the percentage of silicon contained in the iron which it represents.

In the scale which he is using each ounce in the multiple beam weights represents 1 per cent. of silicon, and the weights can be arranged by adding weights of various amounts, so that they will correspond to the percentage of silicon in the various irons used, each weight representing one kind of iron.

Having arranged the weights in conformity to the percentage of silicon in the various irons, the weights are placed in position on the multiple scale beams in accordance with the quantity of each iron which it is intended to use. The instrument he is using is designed for a net ton, or 2000 pounds. For example, the weight on one of the multiple scale beams is set at 600 pounds, indicating that for that particular iron it is proposed to use 600 pounds in a net ton. On the second beam the weight is set at 400 pounds, indicating that 400 pounds of that iron will be used. On the next beam the weight is set at 800 pounds, and on the fourth beam the weight is set at 200 pounds. It will be noted that these weights make 2000 pounds in all. Having placed the weights in conformity with the proposed mixture the weight on the single beam on the opposite side is moved along the scale until it exactly balances the others, when its position on the scale indicates the average silicon. From this may be deducted the expected loss in silicon (say one-quarter of 1 per cent.), or the single weight can be made to allow for this without any figuring whatever.

It is obvious, of course, that the instrument may be used in the opposite way from the above, setting the single weight at the silicon desired, and then adjusting the multiple weights until they balance, remembering that the total must always be 2000 pounds for the left hand weights.

If it is desired to ascertain the mixture in a charge larger or smaller than 2000 pounds, it is only necessary to change the large weight on the single beam. In the device he uses this weighs 10 ounces, and for a charge of, say, 1200 pounds it would be changed for one weighing 6 ounces.

A single scale would serve for all the different weights used, but it is thought that the use of a number of scale beams makes the device easier to use and understand.

This instrument can also be used to determine the average of any other element in the iron.

Papers were read as follows:

"The Continuous Operation of the Iron Foundry," by J. C. Knoeppel, Oswego, N. Y.; "Foundry Responsibility," by F. W. Stickle, Jamaica Plain, Mass.; "Foundry Control," by R. P. Cunningham, Holyoke, Mass.; "Foundry Management," by David Spence, Chicago, Ill.; "Permanent Molds," by Jas. A. Murphy, Erie, Pa.; "Note on Continuous Molding," by Edward Richelieu, South Tacoma, Wash.; "Molding Machines," by Edward Gilmour, Peoria, Ill., and another on the same subject

by S. H. Stupakoff, Pittsburgh, Pa.; "Trials of a Foundry Foreman," by A. M. Loudon.

A note on "Continuous Molding" was read by Edward Richelieu, South Tacoma, Wash. He said:

"I was very much interested in the recent paper of Dr. Moldenke in which he discusses the eight-hour day, calling it a good move on the part of the foundry, provided there were three of these days in the 24 hours. This recalls my experience in a London shop in which I spent a number of years. Here everything was ready to start molding at once, and nothing was required of the molders but molding. Helpers weighed the flasks, had the fires ready for skin drying and kept pace with molders to the completion of the mold. Where shank ladle work was made the iron was brought to the floor, and if the helper was trusted he was told to pour. As a rule the helpers were trusted with almost everything in this jobbing shop, and it left the molders to devote practically all their time to molding. Good rigs were provided, and the molders were well satisfied and put up a good day's work. It was not necessary to go around the shop to give lifts, for enough help was provided for the purpose.

"In connection with continuous work I will cite an instance where not only work in quantity was produced, but a great saving in flasks and patterns was effected. The job was making 4-inch pipe. Ten flasks and one pattern only were provided. Three molders in one gang molded up 30 pipes by piece work. Then a gang of three more men came on and made 30 more pipes, and finally the last three men came on and finished up the 90 for the day's work of 24 hours. This shows what can be accomplished in the way of continuous production with a minimum of equipment."

Interesting discussions occurred relative to the use of molding machines, and with regard to the disposal of waste coke.

TUESDAY EVENING SESSION.

The attendance was unusually large at this session, showing the great interest taken in the proceedings. The papers on "Technical Education in the Foundry Office," by I. G. Stuart, Birmingham, England, and on "Estimating Methods," by Wm. Hanson, Philadelphia, were read by title.

W. S. Blauvelt of Solvay Process Company, Detroit, read the paper, by W. J. Keep, on "Retort Oven Coke for Foundry Use," adding much interesting information regarding the process of making such coke. The discussion which followed brought out some statements by foundrymen regarding their experience with retort coke, which was largely satisfactory.

The paper on "Malleable Cast Iron," by Dr. Moldenke, brought out considerable discussion, the stove makers in the meeting showing a special desire to bring out points relative to the suitability or unsuitability of malleable iron for range or stove parts. S. H. Stupakoff, Pittsburgh, read a paper on "Employer and Employee," which met with hearty demonstrations of approval. W. H. Carrier of the Buffalo Forge Company delivered an illustrated lecture on "Heating and Ventilating Foundries and Machine Shops on the Fan System." Another illustrated lecture, by S. S. Knight of the Birmingham Pipe & Casting Company, Birmingham, Ala., on "The Principal Factors of the Iron Industry in the Birmingham District," closed the session.

John Weber & Sons, Incorporated, 12 East Twenty-third street, New York, contractors and engineers for masonry and concrete construction, who until recently confined their operations to the metropolitan district, announce that they are now prepared to execute work anywhere. They make a specialty of power houses and manufacturing plants. Hugo J. Weber is president and Robert Weber treasurer.

At a meeting of the creditors of the Aultman-Miller Company, held at Akron, Ohio, on Monday, June 8, the offer of Judge William A. Vincent to purchase the plant and assets of the company for $640,000 was accepted. Judge Vincent is supposed to have represented the International Harvester Company of Chicago.

The National Machine Tool Builders' Association.

WORCESTER, MASS., June 9, 1903.—The semiannual meeting of the National Machine Tool Builders' Association, which opened a two days' session in Worcester today, had a most enthusiastic first day, in which serious business discussions had to divide the time with pleasurable entertainment provided by the seven Worcester members. Some out of town members arrived last night, but the special car of 18 Cincinnati members brought with it the real beginning of things. When those 18 members entered the Bay State House, under the great American flag that waved over the entrance in honor of the occasion, the meeting might be considered as having opened, although the session did not actually begin until an hour later.

The morning session was a short one. After luncheon the committees of the several sections, lathe and planer manufacturers, had brief sittings. The general meeting was opened at 2 o'clock at Board of Trade Hall, and after two hours of discussion adjourned for the day.

Then the seven Worcester members became the hosts, and until late in the evening gave the visitors an exceedingly pleasant experience. A special car conveyed them to Lake Quinsigamond, where two launches were in waiting, and for two hours they sailed over the beautiful body of water, stopping at the Frohsinn Club and later at the Tatassit Canoe Club, where there was entertainment, and winding up at the Quinsigamond Boat Club, where an elaborate and most excellent dinner was served. After dinner there was speaking, with A. M. Powell of the Woodward & Powell Planer Company as toastmaster, and a number of the gentlemen spoke in response to toasts. The hosts were the Whitcomb Mfg. Company, Woodward & Powell Planer Company, P. Blaisdell & Co., Draper Machine Tool Company, H. G. Barr, F. E. Reed Company and Prentice Bros. Company. The committee of the Worcester members consisted of E. W. Whitmore, Alonzo W. Whitcomb and A. M. Powell.

The members present were:

J. B. Doane, American Tool Works Company, Cincinnati.
W. H. Burtner, Cincinnati Planer Company, Cincinnati.
R. K. Le Blond, the R. K. Le Blond Machine Tool Company, Cincinnati.
Joseph Flather, Flather & Co., Incorporated, Nashua, N. H.
W. P. Davis, W. P. Davis Machine Company, Rochester, N. Y.
Enoch Earle, P. Blaisdell & Co., Worcester.
P. E. Montanus, Springfield Machine Tool Company, Springfield, Ohio.
William Lodge, Lodge & Shipley Machine Tool Company, Cincinnati.
E. M. Woodward, Woodward & Powell Planer Company, Worcester.
A. H. Tuechter, Cincinnati Machine Tool Company, Cincinnati.
Fred. L. Eberhardt, Gould & Eberhardt, Newark, N. J.
Henry Binsse, Binsse Machine Tool Company, Newark, N. J.
C. F. Mayer, Rahn, Mayer & Carpenter Company, Cincinnati.
F. E. Reed, F. E. Reed Company, Worcester.
H. Prentice, Prentice Bros. Company, Worcester, Mass.
John R. Back, F. E. Reed Company, Worcester.
H. G. Barr, Worcester.
P. G. March, Cincinnati Shaper Company, Cincinnati.
J. S. Detrick, Detrick & Harvey Machine Company, Baltimore.
Alonzo W. Whitcomb, Whitcomb Mfg. Company, Worcester.
Charles F. Hilker, Hamilton Machine Tool Company, Hamilton, Ohio.
E. E. Schumacher, Schumacher & Boye, Cincinnati.
B. F. Barnes, B. F. Barnes Company, Rockford, Ill.
E. W. Whitmore, Prentice Bros. Company, Worcester.
A. M. Powell, Woodward & Powell Planer Company, Worcester.
Charles E. Thwing, Draper Machine Tool Company, Worcester.
J. W. Carrel, Draper Machine Tool Company, Worcester.
George F. Stewart, Bradford Machine Tool Company, Cincinnati.
Philip Fosdick, Fosdick Machine Tool Company, Cincinnati.
William A. Greaves, Greaves & Klusman, Cincinnati.

With the members of the association were these visitors:

M. P. Higgins, Norton Emery Wheel Company, Worcester.
W. A. Wilson, Wilson Machine Company, Rochester, N. Y.
R. J. Leavitt, J. R. Vandyck Company, New York.
Mr. Viall, Brown & Sharpe Mfg. Company.
J. R. Vandyck, Higley Machine Company, New York.
A. J. Lovejoy, Becker-Brainard Milling Machine Company, Hyde Park, Mass.
Daniel Nast, Fairbanks Company, Philadelphia.
R. L. Windholz, A. E. Kinsey Company, Cincinnati.
George C. Montague, Norton Grinding Company, Worcester.
Philip O. Geier, Deputy Commissioner National Metal Trades Association, Cincinnati.
P. B. Kendig, Seneca Falls Mfg. Company, Seneca Falls, N. Y.

Joseph Wolf, Hisey-Wolf Machine Company, Cincinnati.
D. Hunt, Jr., Baush Machine Tool Company, Springfield, Mass.
Robert Wuest, secretary National Metal Trades Association, Cincinnati.
John A. Hill, *American Machinist*, New York.
W. R. Wallis, *American Machinist*, Chicago.
F. S. Wetherby, *American Machinist*, Boston.
Alexander Luchars, *Machinery*, New York.
G. H. Gardner, *Iron Trade Review*, Cleveland.
D. C. Warren, *Iron Trade Review*, New York.
Walter C. English, *The Iron Age*, Boston.
Fred. W. Schultz, *The Iron Age*, New York.
John Nelson, *The Iron Age*, Worcester.
(*See Telegraphic Report on page* 48.)

Blast Furnace Conditions Affecting the Chemical Composition of Foundry Iron.*

BY W. WALLEY DAVIS, ROANOKE, VA.

The amount of carbon absorbed by iron in the blast furnace is entirely a matter of conjecture from an operating standpoint, and while we can tell with reasonable certainty the amount of total carbon the iron will contain, we are not able to govern it. We know that high temperature and high manganese favor the absorption of carbon, but we also know that the excess of carbon absorbed under these conditions is immediately separated upon reaction of temperature and is thrown out by the metal as free graphite or "kish." The condition of the carbon which permanently saturates the iron is dependent mainly upon the amount of silicon and sulphur the iron contains, and by these is to a great extent governed, but not entirely so. Generally speaking, if we produce an iron that contains high silicon and low sulphur we will have an iron that contains nearly all of its carbon in the form of graphite; but as manganese, the temperature of the iron as it leaves the furnace, its rate of running and the manner of cooling, all have their effect upon the carbon condition we are not certain as to the final result and have no exact means of controlling it.

As foundrymen desire an iron that will show to the least degree the effect of sulphur additions from the fuel in the cupola, it is incumbent upon the furnaceman to produce an iron containing as much graphite and as little combined carbon as possible. As we know that by running the iron high in silicon, low in sulphur and containing about 1 per cent. of manganese we will most nearly meet the required conditions, we seek to control only the last three and through them obtain a species of control of the carbon. Some foundrymen insist upon specifying the percentage of graphitic and combined carbon as well as the percentage of silicon, sulphur, phosphorus and manganese in the irons that they purchase, which is a refinement that is not only unnecessary but in some cases even absurd, for the reasons indicated. It is well enough to desire to use an iron containing a certain percentage of combined carbon or graphite, but in case these are specified fixed percentages of the other elements should not be insisted upon. Furthermore, until we understand with greater clearness the exact nature of the iron carbides in pig iron, and have at hand more ready and direct means of determining them with rapidity and accuracy in the laboratory, their amount should not be specified, particularly as the results desired can be secured with a greater degree of certainty through our more accurate information about the elements, silicon, phosphorus, manganese and sulphur, their influence on carbon conditions and our ability to more quickly and accurately determine them by chemical means.

Too Great Multiplicity of Specifications.

As we gradually depart from the old method of classifying pig iron by its physical appearance, or by the character of the surface of a fresh fracture, we cannot lose sight of the fact that the chemical composition of the iron has a marked effect upon its physical charactertics, and to-day, while many foundrymen who have been educated and trained to the use of pig iron according to its physical appearance have yielded to the modern advance of thought and knowledge to the extent of taking chemical composition into account and specifying the constituents to meet their needs, they yet tack on the grade to be sure they are right. This multiplicity of specifications furnishes a difficult problem for the furnaceman that finds no ready solution.

While, as just stated, the physical appearance of pig iron is to a certain extent influenced by the chemical composition, the influence of the latter is not evidenced in the same manner at all times, nor does the physical appearance furnish a safe guide to its estimation. It is equally possible to make a No. 1 X iron containing 1.50 per cent. silicon, and a gray forge iron containing 3.00 per cent. silicon. While these extreme conditions are usually brought about by variations in the sulphur and manganese, there are other conditions arising from irregularities in the internal condition of the furnace which modify the form of reduction and influence strongly the physical appearance of the iron without greatly modifying its chemical constitution. Such conditions as a slight accumulation on the walls of the furnace which reduces the area and allows a portion of the ore and stone to descend to the tuyeres without having undergone the necessary chemical changes, or causes a freer working on one side than on the other, very markedly influences the physical character of the iron, while the furnace is properly burdened to produce and does produce iron of the proper chemical analysis, so long as the proper temperatures are maintained.

The amount of moisture in the air also has a distinct effect upon the physical appearance of the iron, and to some extent affects the chemical analysis, so that in the warm months when there is less oxygen by volume and a greater humidity in the atmosphere, a greater volume of air is required for the furnace and a greater amount of coke is uselessly consumed in dissociating the water vapor at the tuyeres. Under these conditions it is more difficult to produce the highest grades of iron, as the furnace is more sensitive to any changes that may occur at the top.

Variations in the Metal Produced.

As the operation of the blast furnace is a continuous process, suspended only in the case of accident or for a few minutes at intervals for the purpose of tapping the metal, and as each variation in the nature of the raw materials charged causes variations in the reactions in the upper part or the laboratory of the furnace, it follows that variations are almost constantly occurring in the nature of the metal collecting constantly in the crucible of the furnace. While these variations may be only slight under ordinary conditions they are nevertheless variations, and the body of iron that is tapped out at a cast is composed of layers of iron that in some cases have very marked differences in chemical constituents and also differences in physical characteristics.

There is no rule by which we can tell what these differences may be except by noting the condition of the furnace at short intervals during the time the iron has been formed, and even in this way it is only a matter of judgment. The writer has noted a variation of 1.27 per cent. in the silicon and 0.28 per cent. in the sulphur in a cast of 19 beds of 25 pigs each, taking three pigs from each bed and analyzing separately. No variation in the phosphorus was found, and only 0.30 per cent. variation in the manganese. The average analysis of the whole cast was:

	Per cent.
Silicon	2.08
Sulphur	0.039
Phosphorus	0.76
Manganese	0.72

While a variation as wide as this may be unusual, it is a matter of fact that no two beds of iron will analyze exactly alike, and it is this variation that very frequently creates controversies between the manufacturer and the consumer, as the manner of sampling causes variation in results, more so especially when some of the conditions named have caused numerous slight changes to occur in the working of the furnace in short periods of time. As it is not feasible to analyze each bed of iron on account of the time required the furnaceman secures his analyses from small samples dipped at intervals from the runner and analyzes them separately or combined, according as the furnace may be working irregularly or regularly. The information derived in this manner furnishes the basis for the classification of iron and determines its destina-

* Abstract of a paper read before the American Foundrymen's Association, Milwaukee, Wis., June 9 to 11, 1903.

tion. As it is not possible to entirely overcome all irregularities in foundry iron the furnace should be given sufficient latitude in the matter of specifications to allow for reasonable variations.

In this connection it may be stated as a general proposition that a furnaceman should be allowed the widest limits possible, particularly as regards silicon and sulphur, and that the foundryman should be made acquainted with all the small variations in each car of iron to the fullest extent of the furnaceman's information.

End of the New York Building Tie Up.

It was officially announced on Tuesday afternoon by James Sherlock Davis, vice-president of the Lumber Dealers' Association of New York, on behalf of the Lumber Trades Association, the Association of Dealers in Masons' Building Material and the New York Owners' Association, that the lumber and building materials yards would be opened on Wednesday, and that dealers would accept material, whether delivered by union or nonunion men. This action, which practically means the end of the tie up in building operations in New York City and vicinity, was the result of a conference held with a committee of 16 building trades unions, which, on Monday, split from the Board of Building Trades over the question of the shutting out of unskilled labor from representation in that body.

At a meeting of the United Board of Building Trades, held on Monday, the delegates of 16 unions, representing the skilled labor element in the building trades, seceded from that organization after a proposition to exclude the Material Drivers' Union, the body over which the original conflict began, from the Board of Building Trades. These 16 unions included the Amalgamated Society of Carpenters and Joiners, the Amalgamated Sheet Metal Workers, plain and ornamental plasterers, plumbers and gas fitters, electrical workers, marble cutters, mosaic and encaustic tile layers and helpers, steam and hot water fitters, steam fitters' helpers, granite cutters, derrick men, riggers and pointers, journeymen stone cutters, Brotherhood of Painters and Decorators, elevator constructors and slate and tile roofers, representing in all a constituency of nearly 30,000 workmen. These seceding unions formed a new building trades council, and, as intimated on Tuesday, made an agreement with the lumber and building material dealers, by which they will accept supplies, no matter by whom handled or delivered. This involves a complete victory for the employers, and justifies entirely the position taken by them in refusing to accede ot the demand of the Drivers' Union that no material should be used in building construction, except that delivered by members of the union.

The revolting members of the Board of Building Trades signed their names to an agreement, which was given out after the meeting, and the provisions of which are embodied in the following official statement:

The Lumber Trade Association, the Association of Dealers in Masons' Building Materials and the New York Truck Owners' Association, express satisfaction in the action of the higher skilled trades unions yesterday. It shows that these unions, as well as the public, have grasped the fact that there is no point of contact between the material dealers and the skilled trades. Between them comes the contractor or builder and the owner. They, on the one hand, buy the material, and on the other hand employ the skilled workmen. This being the case there is certainly no reason, in fact, for conflict between material dealers and labor unions of skilled workmen.

Lumber and material dealers have all along insisted on a clear understanding of these conditions. The higher skilled trades have recently come to realize these conditions, and now also insist on a like understanding of them. No artificial concoction, such as including the Drivers' Union and the Material Handlers' Union, should exist by such unions having membership in their United Board. They now realize, too, that such membership can but work injury to the skilled workmen.

The position of the representatives of the 16 skilled labor unions is given as follows: "In reporting to the United Board the committee made a recommendation which was overruled by the laborers and unskilled men of that body. The mechanics of that body, therefore, saw fit to withdraw from the United Board of Building Trades and formed a new organization composed entirely of mechanics." The agreement continues as follows:

The committee hereby bind these organizations that they will not interfere with the free use of any supplies delivered by any members of said dealers' associations, no matter under what conditions, or by whom, they might be made, handled or delivered, and will not take any part in any trouble originating with the material drivers or material handlers or any other unskilled labor.

And they further agree, that in the new association of the above named bodies of mechanics the new body will be bound by the action of this committee, and any new membership that may be allowed to join their association shall also be bound by this action. This, however, is done in consideration of the supply dealers agreeing to open their places of business for the delivery of material not later than Friday, June 12, 1903.

The boycott in Brooklyn is also declared off.

Another satisfactory development of the week is the end of the strike in the building trades in Westchester County and Connecticut, which has kept several thousand mechanics idle for two months. The men are returning to work on the same terms which existed before the strike, and it is generally admitted that the Master Builders' Association, formed by the employers in the district named to resist the encroachments of the unions, has won a decided victory. The men are returning to work for two weeks at the employers' terms, and in the meanwhile they carry on negotiations, with the object of trying to gain some minor points which were embodied in their original demands. The Master Builders' Association has a membership of 800 contractors, builders and owners in Westchester County and Connecticut. They have decided that hereafter they will have no dealings whatever with the Building Trades' Councils, but will transact all negotiations with the unions separately, or with the workmen as individuals. By following this policy it is believed that many strikes will be avoided.

PERSONAL.

The Philadelphia Pneumatic Tool Company, in order to take care of their largely increased business in the Middle West, have employed J. F. Ahern, formerly with the Scully Steel & Iron Company of Chicago, to assist G. Hollingshead, Western sales manager in that city for the Philadelphia Company. This company have also appointed H. B. Griner, late assistant manager of the Chicago Pneumatic Tool Company, to a position in the main office of the Philadelphia Pneumatic Tool Company.

A. S. Colby and John McLeod have been nominated as members of the American Society for Testing Materials, whose annual meeting is to be held at the Delaware Water Gap on July 1, 2 and 3.

De Courcy May, general manager of the New York Shipbuilding Company of Camden, N. J., has been elected president of the company to succeed Henry G. Morse.

Henry C. Frick of Pittsburgh, Pa., has been re-elected a director of the Chicago & Northwestern Railroad for three years.

James Mitchell, formerly private secretary to Thomas Morrison, who recently resigned as general superintendent of the Edgar Thomson Steel works and furnaces, has also resigned and was presented with a gold watch by the office force.

Ralph Crooker, Jr., has been appointed consulting engineer for the Jones & Laughlin Steel Company, in charge of all improvements.

Michael Baackes, consulting engineer, Cleveland, Ohio, sails with his family on June 11 for Krefeld, Germany, where he will locate as consulting engineer. Mr. Baackes is well known to the wire nail trade, having been the pioneer in that business in the United States.

Kern Dodge of Dodge & Day, Nicetown, Philadelphia, Pa., has been successfully operated on for appendicitis.

G. G. McMurtry, president of the American Sheet Steel Company, has sailed for Europe.

At Pittsburgh R. B. Mellon has been elected on the

Executive Committee of the Standard Steel Car Company, and L. G. Woods has been elected treasurer to succeed A. K. Graser.

Charles L. Hall, formerly purchasing agent of the New York Shipbuilding Company of Camden, N. J., has been appointed general manager of the corporation. He succeeds De Courcey May, who was elected president of the company to fill vacancy caused by the death of Henry G. Morse. Mr. Hall has also been elected vice-president.

MANUFACTURING.

Iron and Steel.

Haselton Furnace of the Republic Iron & Steel Company, at Haselton, near Youngstown, Ohio, has made an average of 311 tons of Bessemer iron in 120 days. During April the average output per day was 316 tons, and in May 321 tons. The largest average output per day in any one week was 336 tons and the largest output in any one day was 392 tons. From the fact that this furnace is only 16½ x 76 feet in size, these records can be regarded as extremely creditable.

At a recent meeting of the Struthers Furnace Company, operating the blast furnace at Struthers, Ohio, W. C. Runyon was elected president, J. D. Stubbs vice-president, A. Grossman treasurer, Geo. L. Fairbank secretary, S. A. Richards general superintendent and David Tod manager of cement department. The blast furnace of the company is now idle, while extensive repairs are being made.

The blast furnace of the Toledo Furnace Company, owned by Pickands, Mather & Co. of Cleveland, has been put in operation. The output of pig iron will be sold under the brands of "Toledo Scotch Iron, "Toledo Foundry Iron" and "Toledo Malleable Iron."

The Jones & Laughlin Steel Company have recently bought considerable ground adjacent to their Eliza furnaces on Second avenue, Pittsburgh. It is probable this ground will be utilized for the building of a fifth blast furnace, work on which is expected to be started within a short time.

Glen Iron Furnace, Glen Iron, Pa., was blown in on May 15.

The Secaucus Furnace, Secaucus, N. J., now undergoing repairs, is expected to blow in about June 15.

The Franklin Furnace, at Franklin Springs, N. Y., was blown out for relining on June 1.

The Johnson City Furnace, Johnson City, Tenn., was blown in on May 31.

The Struthers Furnace Company, Cleveland, Ohio, expect to blow in the Anna Furnace, now undergoing repairs, about the 15th inst.

The Centre Furnace Company, Laird, Ohio, expect to blow in Centre Furnace during the present month.

The La Belle Iron Works, at Steubenville, Ohio, blew in their Northside Furnace on May 31.

Northside Furnace, belonging to the Northside Iron Company, at Sharpsville, Pa., went out of blast May 19.

The report that the United States Steel Corporation would connect the blast furnaces at Newburg and the mills of the Lorain Steel Company, at Lorain, Ohio, is officially denied.

The Vulcan Crucible Steel Company of Aliquippa, Pa., manufacturers of high grade crucible and open hearth steel, have bought 4 acres of ground adjoining their plant, which will be used for an extension to the melting department. The open hearth furnace which they have had under erection for some time is about completed and will be started up early this month. The 10 and 12 inch mills and the hammer department are in full operation on double turn.

The report that the McKeesport works of the American Sheet Steel Company, at McKeesport, Pa., would be entirely rebuilt and greatly enlarged is incorrect. Nothing special is to be done at this time at the McKeesport works, other than the replacing of a wooden building with a modern structure and remodeling one or two of the mills.

The new universal skelp mill of the Ninth street mills department of the Reading Iron Company, Reading, Pa., has been put in operation and is working satisfactorily. It consists of a three-high universal roughing train, with three-high plain finishing train in tandem, each driven by an idependent engine. The rolls are 22 inches in diameter and the mill is intended for rolling iron and steel skelp from 8 to 22 inches wide. The mill is provided with six gas furnaces, electric traveling cranes and all other modern appliances, and most of the machinery was built in the company's own shops of their Scott foundry department.

H. Sofransey & Son, Allentown, Pa., dealers in scrap iron and steel, have purchased the Catasauqua rolling mill plant. It is the intention to wreck the plant and dispose of the second-hand machinery and scrap.

The Hainsworth works of the American Steel & Wire Company, at Pittsburgh, which is a Bessemer plant and contains two five-gross-ton converters, two heating furnaces, blooming and billet mills, and which has been idle for some time, will be started up within a very few days. The output of this plant is about 700 tons of Bessemer billets per day, and this will be used in the various works of the American Steel & Wire Company, which have been somewhat short of steel for some time.

The Carbon Steel Company of Pittsburgh recently shipped an ingot weighing about 110,000 pounds to the Fore River Ship & Engine Company, Quincy, Mass., which is to be forged into a crank shaft for the United States battle ship "Rhode Island." This is not the largest steel ingot ever cast in Pittsburgh, as claimed, but is probably the largest ever shipped out of Pittsburgh in ingot form.

General Machinery.

At Pittsburgh the case of the Lazear Gas Engine Company of Rochester, N. Y., against John E. Du Bois of Du Bois, Pa., was decided for the plaintiff. The plaintiff claimed $115,000 damages for failure to complete and deliver gas stoves under the terms of a contract. The jury gave a verdict for $34,250 in favor of the plaintiff.

The Buffalo Steam Pump Company, whose works are at North Tonawanda, have been purchased by William F. and Henry W. Wendt, who are also owners of the Buffalo Forge Company and the Geo. L. Squier Mfg. Company. The North Tonawanda works of the steam pump company are to be continued as heretofore and the main offices will be in Buffalo.

George H. Danner, Charles R. Rail and Joseph K. Smith announce that they have severed their connection with the Best Mfg. Company of Pittsburgh, and have organized the Pittsburgh Piping & Equipment Company. The new concern will conduct a general pipe fitting, pipe bending and machine shop business and will also supply brass and bronze castings for blast furnaces, rolling mills, &c. The works of the company are at Thirty-fifth and Smallman streets and the offices are in Rooms 1111-1112 Westinghouse Building, Pittsburgh.

A considerable amount of new machinery is required by the Winton Motor Carriage Company of Cleveland, Ohio, for the additions they are building to their plant. The company make a point of securing the latest machinery on the market, such as boring mills, milling machines, lathes, drill presses and any other machinery wherein they can see a saving. Two of the new buildings are in course of construction, and the others will be under way within the next month.

The Crestline Mfg. Company, Crestline, Ohio, are erecting a new structure, to be used as the machine shop department of their plant, 130 x 160 feet, adjoining which is boiler room, engine room and fuel room, all divided by heavy brick walls. In addition to this a new foundry is being also erected, 80 x 100 feet. The present machine shop, in the main building proper, will be used as a paint shop and warehouse as soon as the new structure is completed, which will be within 30 days.

The strike at the shops of the C. B. Rogers branch of the American Wood Machine Company, at Norwich, Conn., has been settled, and the strikers, comprising about 25 per cent. of the company's force, have returned to work after being idle a week. The settlement was effected by the company agreeing to meet a committee of the men at any time to investigate and adjust differences, while the men agreed not to insist on the exclusive employment of union men, provided union men were not discriminated against. The company has previously announced a reduction from a ten to a nine hour day, to go into effect July 1.

The new plant of the Foskett & Bishop Company, manufacturers of steam traps and steam specialties, at New Haven, Conn., will have as a main building a structure 70 x 280 feet, in two sections, one two stories high and 112 feet long, the other 168 feet long and one story. The building will be used principally as a machine shop and for pipe cutting and threading, and in addition there will be space for storage of pipes, steam fittings, valves and steam specialties. Work of building will begin immediately.

Though they have purchased all the machinery with the exception of the cranes for their proposed new plant, the Cross Engineering Company of Carbondale, Pa., will not erect the new buildings at present.

The Eclipse Machine Company of Cleveland, manufacturers of street car fenders, trolley poles and other specialties, are preparing to go into the manufacture of several new lines of goods, and have leased a whole floor in the Vulcan Power Building and are equipping it for a machine shop. They are securing figures on about $10,000 worth of machine tools.

Power Plant Equipment.

The Pittsburgh Boiler & Engine Company, Park Building, Pittsburgh, recently sold six tubular boilers to the Pittsburgh Coal Company and four 75 horse-power water tube boilers to the Allegheny General Hospital, and also a number of automatic throttling engines. The company now represent the W. D. McNaull Company of Toledo, Ohio, makers of the McNaull water tube boiler.

The Waterous Engine Company, St. Paul, Minn., have com-

pleted plans for a new plant of three brick and steel buildings, to be erected on the site of their buildings destroyed by fire. Orders for machinery have already been placed. The main building will be 75 x 200 feet and the others 50 x 80 feet each.

The Farrar & Trefts Iron Works, manufacturers of boilers and engines, Buffalo, N. Y., are completing an addition to their boiler shops, which will largely increase the capacity. This firm have in hand orders for a number of 250 and 350 horse-power Bogart gas engines, of which they make a specialty.

The extent of the large Corliss engine business conducted by the Westinghouse Machine Company through Westinghouse, Church, Kerr & Co. of New York is well brought out by the fact that within less than five years, during which the Westinghouse Machine Company have taken up the manufacture of large Corliss engines, a total of over 160,000 horse-power have been sold, comprising four distinct types—vertical three cylinder compound, vertical cross compound, horizontal cross compound and horizontal tandem compound. The equipments now in service include such plants as the New York Edison, Brooklyn Edison, Third Avenue Railway, Boston Elevated Railway, &c. This record is particularly gratifying to the Westinghouse interests, in that it represents but one branch of effort in the engine building business, the Westinghouse Machine Company being also builders of the large American gas engines and steam turbines.

The Ohio Motor Company of Sandusky, Ohio, manufacturers of gasoline engines, have increased their capital stock from $25,000 to $50,000, and they are preparing to install considerable new machinery. They erected a large addition to their factory some months ago.

Foundries.

The Racine Steel & Iron Mfg. Company, Racine, Wis., manufacturers of cast and steel wagon skeins, jack screws, &c., have installed a No. 9 Whiting cupola and a No. 7 Green positive blower, increasing their melting capacity to over 80 tons per day. They expect to increase their capital stock to $200,000 at their annual meeting in August, and complete plans, already laid out, which will make the plant sufficiently large to handle 80 per cent. of the skeins business of the United States.

The Pennsylvania Malleable Company, McKee's Rocks, Pittsburgh, are building an addition to their foundry, 60 x 180 feet, and also a coreroom, 40 x 120 feet. When these additions are completed the company will increase their output from 60 to 85 tons daily, and will employ about 50 more molders. The company are an indentified interest of the Pressed Steel Car Company.

The Commonwealth Steel Company, St. Louis, Mo., have received an order to supply separable body bolsters and truck bolsters for 500 cars for the National Railway of Mexico.

The S. Obermayer Company, with general offices at Cincinnati, Ohio, report a continued good trade, far exceeding last year's sales. The shipments from the Larimer plant during the month of May consisted of 250 carloads, averaging 20 tons each. Shipments from the Chicago plant 80 carloads during the month, and from the Cincinnati plant 110 carloads. Total from the three plants 440 full carloads of foundry facings and blackings.

The Schill Brothers Company, Crestline, Ohio, are now working upon a new foundry building, 125 x 390 feet, the east end of which will be two stories, all of brick. The lower story will be used as a cleaning room, the topography of the ground being such as to enable the company to bring in their raw material, such as pig iron and coke, on a level with the molding floor. The company have had an exceptionally good demand for their steel ranges and furnaces and for the fall trade have added a complete line of oak stoves, guaranteed to be absolutely air tight and to retain fire 24 hours. These are made in five sizes—Nos. 12, 14, 16, 18 and 20—for coal or wood.

The Merrell Mfg. Company, Toledo, Ohio, are making an addition to their plant for foundry purposes and will move the necessary machinery thereto, using the present foundry for an erecting room.

The Pennsylvania Railroad have recently bought a large site of ground adjacent to their shops at Altoona, Pa., and it is stated will build a very large car wheel foundry on the ground.

Bridges and Buildings.

The D. G. Henry Company have been incorporated at Buffalo, N. Y., and will erect iron, steel and metal buildings of special construction, under patents issued to D. G. Henry. The directors are D. G. Henry, George W. Butler and Charles Diebold, Jr., all of Buffalo.

John Eichleay, Jr., Company, Pitsburgh, are completing a new structural iron works at South Twentieth and Merriman streets, in that city, which will be ready for operation in two weeks. The building is 150 x 180 feet and will be electrically equipped throughout. The company will also continue operations in their present quarters in Wharton street, from Twenty-first to Twenty-second streets, and with their new plant will be better prepared to do general structural iron and steel work connected with the construction of buildings, bridges, &c.

Owing to inability to secure building space adjoining their present factory, the Massillon Bridge Company of Massillon, Ohio, are still undetermined regarding their future plans. They have received propositions from all over the country, from as far west as San Francisco and as far east as New York. They prefer to remain in Massillon, but it seems probable that some move will have to be made unless the citizens of that place arrange to let them have space for expansion. A very flattering proposition has been made by the Mansfield, Ohio, Board of Trade, and the matter will probably be setled one way or another in a very short time.

Fires.

The Gainesville Iron Works, Gainesville Cotton Mills and several other plants in Gainesville, Ga., were recently wrecked by a cyclone. The loss is very large.

The Barnes Safe & Lock Company's plant at Granville, N. Y., was damaged $20,000 by fire June 1

The plant of the Ohio Foundry Company, Dayton, Ohio, was recently damaged $20,000 by fire.

The plant of the Atlantic Window Glass Company, Magnolia, N. J., was destroyed by fire June 4, entailing a loss of $60,000.

The tannery of W. D. Byron & Sons, Williamsport, Md., was destroyed by fire June 8. The loss is about $200,000.

Hardware.

The Yost Electric Mfg. Company, Toledo, Ohio, have, within 60 days from date of letting contract, completed the erection of a new brick plant, 40 x 200 feet, two stories in hight, and installed therein considerable new machinery especially adapted to the production of the New Century lawn sprinkler and the Yost electric lamp socket. The new plant gives them three times their former capacity.

The J. I. Case Threshing Machine Company and the J. I. Case Plow Works of Racine, Wis., on May 31 suffered loss by fire of about $150,000 on the threshing machine plant and $5000 on the plow works. Sheds of the thresher company which were destroyed contained 200 separators and 100 engines. The loss sustained is covered fully by insurance.

The blacksmith shop of the new plant of Pettibone, Mulliken & Co., which is under construction at West Division street and the Chicago & Western Indiana tracks, Chicago, was partially destroyed by a cyclone May 25, causing a loss of about $10,000, which will be borne by the contractors. Construction will not be materially delayed, and it is expected that manufacturing operations will begin at the new location early in July.

The Interlocking Fence Company have been incorporated at Morton, Ill., with a capital stock of $25,000, to manufacture wire fence. The incorporators are John Wittmer, John Getz, Jr., and Joseph Hauter, Jr.

Enterprise Paint Mfg. Company, Chicago, Ill., have just contracted for a new factory, to cost $75,000. The building will be 70 x 117 feet, five stories and basement, and will be constructed of pressed brick. The increase in their business compels them to abandon their old quarters, and it is expected that the new factory will enable them to do full justice to their increasing list of customers.

Norwich Nickel & Brass Company, Norwich, Conn., manufacturers of display frames, stands and specialties for show windows and store interiors, and electroplaters in nickel, copper and silver, in view of their enlarged business and the need of greater facilities, have lately added materially to their capital stock.

The Elmwood Mills, Providence, R. I., manufacturers of shoe lacings, have under construction on Mawney street a four-story brick building to be used for manufacturing purposes.

Delphos Can Company, Delphos, Ohio, have lately, among other improvements, put in several new power presses, which enable them to turn out goods faster and to fill all orders, large or small, on the day of receipt. The company are now making three different lines of cans—namely, the Delphos pump oil cans, Neverleak spout and faucet cans, and C. C. goods, common cans. They have just commenced the manufacture of common cans and are in a position to quote prices. These cans, they explain, are not tested and guaranteed against leakage, as is the case with their Neverleak line, but are made of the same material. The company have also purchased 3 acres of land and are contemplating putting up a three-story building, 80 x 200 feet, as they have not sufficient room at their present location. This factory will be built along the P. F. & W. C. Railroad, which will afford better shipping facilities.

Schatt & Morgan Cutlery Company, Titusville, Pa., in their new plant have double their former capacity, yet although working 70 hours a week they are unable to fill orders. From the first it has been the policy of the company to sell goods only to the hardware trade, and they attribute their success to strictly adhering to this as well as to the maintenance of the quality of their product. They are now putting on the market something new in the way of a combination knife and manicure implement. They are also preparing to market a common-sense wrought steel detachable screen door hinge, and will shortly issue a new catalogue.

Indiana Rolling Mill Company, New Castle, Ind., expect within the next 60 days to have their new machinery installed,

which, they advise us, will fully treble the present output of their shovel factory, giving them a capacity of 300 to 400 dozen per day. They state that their line is now complete, except the Maynard shovel, which they hope to be putting on the market within a few weeks. Their steel mill is now in successful operation, rolling high carbon shovel steel, with a capacity of 30 tons of finished steel per day. They have a fine natural gas supply, having recently completed several more new wells. The Xenia Handle Company, which they own, are turning out 1100 to 1200 dozen handles per week, so that they have a nice stock ahead and hope to be in a position to furnish enough handles for their enlarged output, reference to which is made above.

The Findlay Ax & Tool Company, Findlay, Ohio, are installing considerable new machinery and among the new equipment recently ordered is a large drop hammer for their forge shop, and a heavy punch for punching eyes in edge tools. This will be one of the largest tools of its kind in Ohio. The company are exceedingly busy on orders for their tools.

Miscellaneous.

The Pittsburgh Cast Iron Brazing Company have been organized to manufacture brazing outfits under patents of the American Brazing Company of Philadelphia, and have located in the Eagle Power Building, Allegheny, Pa., which they will equip with the necessary machinery for the manufacture of these goods.

The Racine Boat Mfg. Company, Racine, Wis., whose plant was recently destroyed by fire, have obtained temporary quarters until they can rebuild. Just what machinery will be required is not yet known.

The Tennessee Lumber & Coal Company of Syracuse, N. Y., have been incorporated with a capital of $1,000,000, to manufacture lumber, iron, steel, manganese, coke, copper &c. Thomas Merriam, Syracuse, and P. P. Miller and O. M. Rothfuss of Corning are the directors.

The Gould Coupler Company and the Gould Storage Battery Company, whose works are located at Depew, N. Y., a manufacturing suburb of Buffalo, have filed articles of incorporation with the Secretary of State at Albany, with a capitalization of $5,000,000 each. The directors are Charles A. Gould, Charles M. Gould, William S. Gould and Frederick P. Gould, all of New York City. Both of the companies formerly did business under West Virginia charters.

The Northwestern Electric Company, Chicago, have been incorporated with a capital stock of $5000, the incorporators being Henry D. Cheney, Peter L. Evans and James R. Deane. The company will manufacture electrical supplies.

The new factory building of the American Tower & Tank Company, at Elgin, Ill., was completed June 1. The structure is 145 feet long and 60 feet wide and is located south of Oak street and east of the Chicago, Milwaukee & St. Paul Railroad, a switch track from which runs through the center of the building, permitting the convenient loading and unloading of freight with pneumatic machinery. It is the intention of the company to immediately begin the construction of other buildings, including a power house.

The Haywood Wagon Company have been incorporated, at Syracuse, N. Y., with a capital of $130,000, by Wm. B. Smith, Frank J. Webb and E. I. Edgcomb. The company expect to acquire a plant, including machinery, at Baldwinsville, near Syracuse. The principal business will be the manufacture and sale of dumping wagons, under patents issued to John W. Haywood.

The Franklyn Rubber Mfg. Company have purchased the Mercer Rubber Company of Trenton, N. J., and propose to enlarge the business of manufacturing and selling mechanical rubber goods, especially in lines used by the railroad and steamboat lines. The Franklyn Rubber Mfg. Company have associated with them the J. B. Reilly Supply Company of New York City, who will be the sales agents.

The National Brass & Iron Works have completed at Reading, Pa., a new four-story brick building for manufacturing purposes. They have also purchased and are installing a new 250 horse-power Corliss engine.

The incorporation is announced of the Southern Stove Works, Evansville, Ind. This is a reorganization of the firm of Kiechle, Bretano & Co., a private corporation, following the death of one of the partners.

The Safety Steel Derrick Company of Bowling Green, Ohio, have been organized by Dr. W. M. Tuller, R. A. Beatty and others of that city, to manufacture a steel derrick for oil wells, invented by Irvin Weaver of Townline. The derrick may be easily moved from one well to another by a steel truck, to which it is attached. For the present the device will be manufactured by a Pittsburgh concern, but the owners are contemplating erecting a large factory in Wood County for the manufacture of the specialty.

The Board of Public Service of Toledo have turned down proposals made by a number of manufacturers for furnishing water meters, and have readvertised for 1500 five-eighths and three-eighths meters. The original bids were from $6.70 to $8.20 per meter, according to connection. The Toledo authorities are inclined to think there is a combination among water meter people, as the prices were practically uniform. It is claimed Columbus and Cleveland have been buying meters at much lower figures.

The Sykes Iron & Steel Roofing Company of Niles, Ohio, recently made a large shipment of roofing to the interior of Turkey, Asia. The point to which the order was shipped was about 400 miles in the interior of Turkey and the goods will have to be conveyed from the seaboard on the backs of pack animals.

J. Bishop & Co., Malvern, Pa., manufacturers of platinum ware of all descriptions, are about to begin the erection of a new plant at the above place. Their present factory has been of a temporary nature, taken after the destruction by fire of their former works at Sugartown, Pa. The new factory will be a two-story brick building of irregular shape and will be equipped with new machinery and modern appliances for working platinum. Bishop & Co. have been established since 1842 and under the firm name of J. Bishop & Co. for the past 25 years. The name of the Sugartown Platinum Company, as applied to the above in a recent issue, was incorrect.

The report that the plant of the American Belting Company of Youngstown, Ohio, would be sold to the Erie Railroad and then resold to the Republic Rubber Company is untrue. The property of the American Belting Company is in no way suitable for a railroad storage yard, and no negotiations are on for the sale of the plant to the Republic Rubber Company.

The Cleveland Switchboard & Mfg. Company of Cleveland, manufacturers of electrical switchboards and other electrical specialties, have established a new factory at the corner of Michigan and Champlain streets, which gives them several times the floor space of their oldfactory. They are buying considerable new machinery to increase their facilities.

The big floods in Kansas are responsible for the following item in relation to quick work in belt making. The Armour packing plant at Kansas City was rendered useless by the high water, making it necessary to replace the belts in the shortest possible time. Accordingly an order was placed with the Jewell Belting Company of Hartford, Conn., for a 120 foot, 60 inch, three ply belt and a 130 foot, 50 inch, three ply belt, both to be delivered to the express company within 24 hours. Work was started at 6 o'clock in the evening, and the larger belt completed at 7 o'clock the following morning. At 3 o'clock the same afternoon the 50-inch belt was completed also, and the big belts were cased and ready for shipment to Kansas City. This establishes an interesting record in the history of belt making. The entire shipment weighed about 2 tons.

Another New Blast Furnace.—The Jones & Laughlin Steel Company of Pittsburgh, Pa., have completed foundations for a fifth Eliza furnace, to be 21 x 85 feet in size. The columns are now being set, but the iron work for the furnace, which is being built by the Riter-Conley Company of Pittsburgh, Pa., is being seriously interfered with by the strike of the boiler makers and other crafts in Pittsburgh. It was hoped to have this furnace ready for blast by January 1, 1904, but on account of the present delays in construction this will be impossible. The Jones & Laughlin Steel Company have plans prepared and most of the equipment placed for the building of four more Talbot open hearth furnaces, which are expected to turn out about 1500 tons of steel per week each. Plans are also under way for the building of a large rail mill, and also auxiliary mills for rolling sheet and tin bars.

The Pickands-Magee Coke Company of Pittsburgh, Pa., have applied for a charter with a capital of $500,000, and offices will be opened in either the Frick Building or Farmers' Bank Building in that city. The incorporators are W. C. Magee of Pittsburgh, Pa.; C. P. Wheeler of Cleveland, Ill.; C. P. Boynton of Chicago, Ill.; William M. Hall, Jr., and Watson B. Adair. W. C. Magee, who was formerly vice-president of the H. C. Frick Coke Company, will be president of the new concern. It is the intention of the company to buy and sell coal and coke, lease, mortgage and exchange coal and coke lands. It is said to be the intention of the incorporators to make this the largest independent coke concern in the Pittsburgh district.

The Acheson Company, Niagara Falls, N. Y., who are to erect a plant for the manufacture of siloxicon, are not yet in a position to state just what their needs will be in the way of machinery. It is probable, however, that the matter will be settled within the next two or three weeks.

A Record Production of Pig Iron.

Stocks Increase.

May was a record month for the production of pig iron, and we entered the current month with so many blast furnaces in active operation that we shall make even more iron per day.

Stocks show an increase in nearly all sections, although the accumulation is not large in any one district; compared with the enormous output the stocks seem trivial.

The weekly capacity of the furnaces in blast on June 1 compares as follows with that of the preceding periods:

	Total capacity per week. Gross tons.	Coke capacity per week.	Charcoal capacity per week.
June 1, 1903	398,139	388,178	9,961
May 1	381,697	373,496	8,201
April 1	376,576	368,215	8,361
March 1	354,733	347,424	7,309
February 1	343,111	335,339	7,772
January 1	353,800	346,073	7,727
December 1, 1902	343,817	336,617	7,200
November 1	337,559	330,110	7,449
October 1	345,048	337,837	7,211
September 1	335,189	328,243	6,946
August 1	336,465	328,745	7,720
July 1	310,950	303,793	7,157
June 1	344,748	337,492	7,256
May 1	352,064	337,627	6,437
April 1	337,424	331,140	6,284
March 1	323,028	316,039	6,989
February 1	332,045	325,440	6,605
January 1	298,460	291,992	6,468
December 1, 1901	324,761	317,358	7,403
November 1	320,824	313,775	7,049
October 1	307,982	300,538	7,444
September 1	299,861	293,256	6,605
August 1	303,847	297,269	6,578
July 1	310,850	303,793	7,157
June 1	314,505	306,391	7,514
May 1	301,125	293,915	7,210
April 1	296,676	288,766	7,910
March 1	292,899	284,825	8,074
February 1	278,258	269,923	8,335
January 1	250,351	243,254	7,097
December 1, 1900	228,846	222,067	6,779
November 1	215,304	207,381	7,923

Monthly Pig Iron Production.

	January, (31 days)	February, (28 days)	March, (31 days)	April, (30 days)	May, (31 days)
New York	33,071	35,360	43,941	42,069	47,330
New Jersey	17,378	12,791	14,834	19,998	20,908
Schuylkill	49,007	41,349	48,476	45,234	47,973
Lehigh	58,687	57,638	60,804	61,286	67,409
Susq. and Lebanon	41,147	35,720	46,052	53,782	62,294
Pittsburgh	360,795	328,799	372,125	362,747	415,518
Shenango	111,098	111,725	117,533	127,985	132,208
West. Penn.	93,777	86,037	105,488	97,294	92,016
Md., Va. and Ky.	79,390	83,550	92,798	93,039	92,487
Wheeling	53,907	56,189	64,044	69,743	74,016
Cent. and No. Ohio	90,757	90,575	108,587	110,017	122,442
Mahoning V.	107,510	112,678	137,744	129,988	114,863
Hanging Rock and Hocking Valley	26,707	30,123	37,256	36,929	35,503
Ill., Wis., Minn., Mo. and Col.	170,880	147,179	170,977	199,685	219,666
Alabama	136,907	120,479	126,068	117,372	129,601
Tennessee, No. Carolina and Georgia	41,768	40,383	43,743	41,263	41,940
	1,472,788	1,390,615	1,590,470	1,608,431	1,716,174
Charcoal pig.	34,348	28,742	35,728	37,611	42,249
Totals	1,507,136	1,419,357	1,626,208	1,646,042	1,758,423

The total production for the first five months was therefore 7,957,166 gross tons.

Product of Steel Companies.—It is interesting to segregate from the total product that of the steel companies. Our reports include all the furnaces of the United States Steel Corporation, Jones & Laughlin, Clairton, Bethlehem, Lackawanna, Cambria, Pennsylvania, Maryland, Colorado, Wheeling and the Northern furnaces of the Republic Company. These together made in April 963,097 gross tons, and in May 1,033,515 gross tons.

There were blown in during May one Saucon of the Thomas Iron Company, one Bird Coleman of the Lackawanna Steel Company, the new La Belle and one Mingo in the Wheeling district; the new Toledo and one Columbus in Ohio, and Johnson City and Standard in Tennessee. In the Pittsburgh district one Duquesne and one Edgar Thomson resumed. There were blown out or banked Franklin in New York, Tidewater in the Schuylkill Valley, Northside and Stewart in the Shenango Valley, Grand Rivers and one Watts in Kentucky, Empire in North Carolina, Steubenville in Ohio, Anna in the Mahoning Valley and one Woodward in Alabama.

Coke and Anthracite Furnaces in Blast.

Location, of furnaces.	June 1. Number of stacks.	June 1. Number in blast.	June 1. Capacity per week.	May 1. Number in blast.	May 1. Capacity per week.
New York	17	10	10,181	10	9,816
New Jersey	7	5	4,221	5	4,207
Spiegel	3	3	500	3	459
Pennsylvania:					
Lehigh Valley	27	25	15,115	24	13,843
Spiegel	1	1	106	1	114
Schuylkill Valley	13	12	10,283	13	10,554
Low. Susquehanna	10	8	8,103	8	7,336
Lebanon Valley	12	7	6,300	6	5,213
Pittsburgh District	35	35	90,864	33	83,215
Spiegel	3	3	2,400	3	2,158
Shenango Valley	19	17	28,554	19	30,099
W. Pennsylvania	18	17	20,778	16	22,422
Maryland	5	4	7,351	4	7,144
Wheeling District	12	9	18,550	8	15,534
Ohio:					
Mahoning Valley	15	12	24,700	13	27,365
Cent. and North	15	15	30,448	13	26,150
Hocking Valley	3	2	900	2	933
Hanging Rock	12	10	7,136	10	7,683
Illinois	19	17	36,360	17	33,229
Spiegel	1	1	940	1	958
Minnesota	1	1	919	1	827
Wisconsin	5	5	5,080	5	5,259
Missouri	1	1	851	1	787
Colorado	5	5	5,880	4	5,125
Spiegel	0	0	0	1	407
The South:					
Virginia	23	18	11,734	18	12,404
Kentucky	8	4	1,543	7	2,364
Alabama	41	30	28,226	30	28,235
Tennessee	16	16	9,425	14	8,749
Georgia	1	1	730	1	600
North Carolina	1	0	0	1	307
Totals	349	294	388,178	292	373,496

Charcoal Furnaces in Blast.

Location, of furnaces.	June 1. Number of stacks.	June 1. Number in blast.	June 1. Capacity per week.	May 1. Number in blast.	May 1. Capacity per week.
New England	7	1	79	2	165
New York	3	2	806	1	65
Pennsylvania	5	3	128	1	53
Maryland	1	1	95	0	0
Virginia	3	1	45	0	0
Ohio	8	3	190	0	0
Kentucky	3	0	0	0	0
Tennessee	1	1	71	1	62
Georgia	4	3	980	3	850
Alabama	5	4	1,112	3	1,013
Michigan, Missouri and Wisconsin	14	12	6,115	13	5,720
Texas	4	2	340	1	273
Washington	1	0	0	0	0
Totals	58	33	9,961	25	8,201

A considerable number of charcoal furnaces started in May. Among them we may note: Buffalo, after repairs; Eagle and Glen Iron in Pennsylvania, Muirkirk in Maryland, White Rock in Virginia and Jefferson and Vesuvius in Ohio.

Stocks.

The position of furnace stocks, sold and unsold, as reported to us, was as below on June 1, as compared

with the preceding months, the same furnaces being represented as in former months. This does not include the holdings of the steel works producing their own iron:

Stocks.	Jan. 1.	Feb. 1.	Mar. 1.	April 1.	May 1.	June 1.
Anthracite and Coke.	92,560	106,297	144,394	156,732	147,312	182,665
Charcoal..	7,335	13,344	14,959	14,025	15,430	20,738
Totals..	99,895	119,641	159,353	170,757	162,742	203,403

Iron and Industrial Stocks.

The week has been one of almost uninterrupted liquidation, American Can common dropping to 5¼, preferred to 42⅞, Car and Foundry to 35, American Locomotive common to 20¼, Colorado Fuel to 64½, Dominion Iron & Steel to 10½, Pressed Steel Car to 53, Republic common to 13¼, Sloss-Sheffield to 39½, Tennessee to 49½, United States Steel common, ex-dividend, to 39 and preferred to 79¾.

Stockholders of the Westinghouse Electric & Mfg. Company of Pittsburgh have been notified that subscriptions for the issue of $4,500,000 of new assenting stock at $80 per share at the rate of one share of new for every four shares of existing stock must be accompanied by $30 for each share. This must be deposited by June 8. The balance of the subscriptions are payable as follows: July 23, 1903, $25 per share; September 14, 1903, $25 per share.

Avery & Sons of Louisville, Ky., have increased the capital stock from $581,700 to $1,400,000. Of the latter amount $900,000 is 6 per cent. cumulative preferred with prior right to payment of principal in the case of liquidation or dissolution, and $500,000 in common stock. The holders of the existing 5817 shares of $100 each will exchange these, dollar for dollar, for the new preferred stock and in addition will receive a dividend of 80 per cent. ($465,360) in the new common stock. The company's indebtedness is limited by the articles of incorporation to an amount not exceeding $500,000. In 1892 a mortgage was made to the Bank of Kentucky (now National Bank of Kentucky), as trustee, to secure $300,000 of 6 per cent. bonds, none of which have been sold; they have been merely used from time to time as collateral for temporary loans and can be taken up at any time. The business was established in 1825; it includes the manufacture of plows and other cultivating implements.

Application has been made to the New York Stock Exchange to list $2,848,000 of the first mortgage 5 per cent. convertible bonds of the Lackawanna Steel Company.

Baker & Crabtree of St. Louis, Mo., offer the unsold portion of the $1,000,000 issue of the 6 per cent. first mortgage gold bonds of the St. Louis Car Company. These bonds are due May 21, 1923, but subject to call at any time after five years at 105. Interest coupons payable in May and November at the Missouri Trust Company of St. Louis, Mo. The resources of the company amount, it is said, to over $3,000,000, consisting of real estate, buildings, machinery, material and railroad lines, situated 8000 North Broadway, St. Louis, Mo. The company build electric street cars exclusively, and their present capacity is 2400 cars, or about $4,000,000 yearly. This output is to be increased to 3000 cars annually, or an aggregate of $5,000,000 per year, on which it is estimated there should be a net profit of about $600,000.

Dividends.—The Westinghouse Air Brake Company of Pittsburgh have declared a quarterly dividend of 2½ per cent. and an extra dividend of 3½ per cent., or at the rate of 24 per cent. per annum.

Otis Elevator Company have declared the regular quarterly dividend of 1½ per cent. on the preferred stock, payable July 15.

Sloss-Sheffield Steel & Iron Company have declared the usual quarterly dividend of 1¾ per cent. on the preferred stock, payable July 1. Books close June 20 and reopen July 2.

The Crucible Steel Company of America, of Pittsburgh, have declared the regular quarterly dividend of 1¾ per cent. on the preferred stock.

As yet the Amalgamated Association has not arranged wage scales for hoop mills with the Sharon Steel Hoop Company of Sharon, Pa., and for the hoop mills of the Carnegie Steel Company, formerly operated by the American Steel Hoop Company. Several conferences have been held with the Sharon Steel Hoop Company, and one will be held in a few days with the Carnegie Steel Company. No trouble is anticipated in arranging the wage scale for hoop mills this year.

The plant of the Continental Iron Co., Wheatland, Pa., was sold on Tuesday, June 9, to D. L. Wilson of the Fort Pit National Bank and the Fourth National Bank of Pittsburgh, creditors of the concern. The price paid was $45,500, about $15,000 less than the appraised value. It is said the plant will be greatly enlarged and improved.

Fluctuation in Iron Stocks.

The following table shows the extent of transactions and the fluctuations in quotations of the stocks of iron and steel companies in the month of May, with the dates on which the highest and lowest prices on each stock were realized:

Cap'l issued.		Sales.	Low-Date. est.	May.	High-Date. est.	May
.....	Allis-Chalmers, com...	500	15	29	17	12
.....	Allis-Chalmers, pref...	200	83	9	84	6
$41,233,300	Am. Can, com.....	11,150	5	21	7⅝	4
41,233,300	Am. Can, pref.....	45,500	42⅛	1	47⅝	12
29,000,000	Am. Car & F'dry, com.	27,590	36	26	40⅛	6
29,000,000	Am. Car & F'dry, pref.	3,720	88¼	26	91⅝	12
24,100,000	Am Loco., com...?..	19,100	22¾	25	27⅝	5
25,000,000	Am. Loco., pref.....	4,860	90	25	93⅜	5
.....	Am. Steel F'dries, com	1,500	11	26	16	5
45,000,000	Cambria Steel.....	11,520	22¾	25	24¾	8
7,000,000	Centr. Foundry, com.	2,600	2¾	29	4	9
7,000,000	Centr. Foundry, pref.	700	14	26	18½	1
17,000,000	Colo. Fuel & Iron....	82,500	61¼	8	70⅝	14
25,000,000	Crucible Steel, com...	9,900	16	21	18½	7
25,000,000	Crucible Steel, pref...	5,250	81	26	83½	4
.....	Dominion I. & S.....	26,600	13	21	30½	6
2,368,100	Empire I. & S., com..	....	10	29	14	13
2,281,400	Empire I. & S., pref..	....	48	29	52¾	8
4,449,860	Otis Elevator, com...	....	38	26	42	11
6,350,000	Otis Elevator, pref...	....	95	19	96½	25
16,500,000	Pa., new, pref., Phila.	250	90	29	93	6
12,500,000	Pressed Steel, com...	13,700	55¼	26	61½	5
12,500,000	Pressed Steel, pref...	4,500	89	29	92½	7
10,000,000	Railway Spr., com...	5,200	28¾	25	33¼	4
10,000,000	Railway Spr., pref...	1,500	85	28	87	1
27,191,000	Rep. I. & S., com....	23,300	14⅞	28	19⅞	5
20,306,900	Rep. I. & S., pref....	10,300	74¾	29	78½	6
7,500,000	Sloss-Shef. S. & I.,com.	8,900	48	29	62	6
6,700,000	Sloss-Shef. S. & I., pref.	500	87	28	91½	12
20,000,000	Tennessee Coal & Iron	74,500	54	25	65	5
1,500,000	Tidewater Steel.....	1,000	3	14	3½	1
12,106,000	U. S. C. Pipe, com....	....	50	18	50	18
510,361,300	U. S. Steel Co., com..	401,500	30⅞	29	35⅝	5
508,511,200	U. S. Steel Co., pref..	229,100	80	25	85⅛	5
.....	U. S. St. Co., new 5s.	8,301,000	82⅜	13	86½	29
8,425,000	Vir. Iron & Coal, com.	1,000	30	25	34	1
1,500,000	Warwick I. & S.....	1,000	5⅛	28	5⅛	28

Damage by Floods in St. Louis and Adjacent Territory.—The damage to steel and iron plants and other associated interests in the metal industries on account of the severe floods will figure very heavy. To-day (Monday) conditions are at their worst stage and business in the various plants in East St. Louis, Granite City and Madison, Ill., is practically at a standstill. Among the largest interests affected we may name the following: American Car & Foundry Company plant at Madison Ill.: American Steel Foundries plants at East St. Louis and Granite City: Commonwealth Steel Company plant at Granite City, Ill.; Markle Lead Works plant at Granite City, Ill., and National Enameling & Stamping Company at Granite City, Ill.

The strike of the machinists in the marine shops for a minimum wage scale of $3 a day, which started in the Borough of Brooklyn, has spread to New York, Jersey City, Hoboken, Newark and adjoining towns. As a result of the strike in the Townsend-Downey shipyards at Shooter Island, N. J., the New York Metal Trades Association held a meeting at 203 Broadway, New York, and resolved not to concede any of the demands of the machinists and to proceed immediately to break the strike. Representatives of the Independent Labor League of America were at the conference and explained the purposes of their organization. The Metal Trades Association has appointed a committee to investigate the purposes of the league, with a view of acting in harmony with its members. The Independent Labor League of America has a branch at 39 Cortlandt street and undertakes to supply competent men. They do not countenance strikes, boycotts and the like, but hope to attain the same advantages as the other labor unions through a committee of employees who will take up all such matters with the company against whom the men have a grievance. The membership includes both employers and employees.

George E. McCague, general freight agent for the Carnegie Steel Company, at Pittsburgh, has returned to this country from an extended trip to Japan.

The National Machine Tool Builders' Association.

(By Telegraph.)

Early Wednesday morning the various committees designated to discuss conditions in the different branches of the trade assembled and studied the problems confronting them until 11 o'clock, when they repaired to the Worcester Board of Trade rooms to report to the convention.

The meeting was an executive session, a considerable portion of the time being consumed in the discussion of the apprenticeship problem. This subject was opened by W. A. Viall of the Brown & Sharpe Mfg. Company of Providence, R. I., who described the apprenticeship system in operation at the Providence plant. He said that the applicants must be not less than 16 nor more than 18 years of age. They must be physically sound, of good moral character, and have received an education equivalent at least to that required for graduation from the public grammar schools of the City of Providence. Application must be made in person; and, if accepted, the applicant's name will be registered and due notice given when he will be required to commence work. The first 480 hours of service shall constitute a term of trial. If the apprentice shall, during this term, prove satisfactory, and shall, before the expiration thereof, execute, together with his father or guardian—or if he have no father or guardian, then with some other responsible party—an agreement, then his apprenticeship shall continue for the full term, unless sooner terminated as thereinafter stated. The agreement provides for the payment of a bonus of $50 to the apprentice at the expiration of the trial term and $150 at the expiration of the full term of four years.

Apprentices will be required to serve for the term of four years, each year to consist of 2950 working hours, which with the usual working day of ten hours each, is equal to 295 working days. The remaining working days in each year will be allowed apprentices for recreation, at such time or times as the company shall direct. Graduates of the Providence Manual Training High School well recommended by the principal may have their term of apprenticeship shortened at the discretion of the company.

Apprentices will be required to perform their duties with punctuality, diligence and fidelity, and to conform to the rules and regulations which are or may be adopted for the government of the shops.

Apprentices are not allowed to use tobacco in the shops during working hours.

Apprentices shall make up lost time at the expiration of each year at the rate of wages paid during said year; and no year of service shall commence until the apprentice shall have fully made up all time lost in the preceding year.

The company reserve the right, whenever the state of business demands it, to shorten the hours of labor, or whenever for any reason they shall stop the work, to suspend apprentices wholly or in part, and the making up of time so lost shall be at the discretion of the company.

The company also reserve the right, in their sole discretion, to terminate their agreement with any apprentice, also to discharge him from their employment for nonconformity with their rules and regulations, want of industry or capacity, indifference to his duties or improper conduct within or without the shops.

Apprentices will be paid for each hour of actual service (not including time allowed for recreation or time when work is suspended) the following wages: For the first year, 6 cents; for the second year, 8 cents; for the third year, 10 cents, and for the fourth year, 14 cents. If the company shall terminate the apprenticeship during the time of trial it will pay at the rate of 6 cents per hour for the time worked. Wages will be paid on the regular pay days of the company, as they may be established from time to time. The company will faithfully instruct the apprentice in the machinists' art and trade in their shops during the term of apprenticeship.

The consensus of opinion among the delegates was that a scarcity of apprentices exists in the machine shops of this country, and that steps should be taken to carry more of them at the various plants. Several of the members voiced sentiments to the effect that the terms of apprenticeship should vary in the different industrial districts. It was held that while the terms in force at the Brown & Sharpe shop were excellent for New England they were not exactly suited to other fields, as, for instance, the Cincinnati territory or Western sections.

The delegates indorsed the terms suggested by a prominent machine tool builder at the recent Buffalo meeting of the National Metal Trades Association which were printed in *The Iron Age* at the time.

The members of the association and their guests were entertained at luncheon Wednesday by the Norton Emery Wheel Company at their plant at Barber's Crossing, every one availing himself of the opportunity to look over these works and the shops of the Norton Grinding Company. A special electric car took the party to Barber's Crossing, with Charles T. Allen, secretary of the company, as their cicerone. An excellent luncheon was enjoyed, after which the works were inspected. An exceedingly interesting feature of the visit was a demonstration of some of the latest grinding methods, with an attractive display of ground parts at the Norton Grinding Company's new shop. The new very heavy type of Norton grinder was inspected. The visitors were loud in their expressions of appreciation of the manner of their entertainment.

There was unanimous indorsement of the words of A. H. Tuechter and Harry Hoeffinghoff of Cincinnati, when they exclaimed, "Genuine Worcester hospitality!" From the time the visitors arrived they were in the hands of kindly and generous hosts. The general entertainment was supplemented by little excursions and visits to manufacturing establishments. One little outing greatly appreciated by Western members was a genuine clam bake yesterday noon at the Elk House, at Lake Quinsigamond. It was a frequent expression that Worcester would be a good place for another meeting in the near future, and votes of thanks were passed without the usual savor of perfunctoriness.

American Foundrymen's Association.

(By Telegraph.)

Wednesday morning session was largely devoted to the Metallurgical Section. R. F. Flinterman of the McCormick division of the International Harvester Company, Chicago, Ill., was called upon to preside, and a number of papers of special interest to this section were presented and discussed.

Recommendations of permanent officers for the section were made to the Committee on Nomination of Officers as follows: Chairman, W. G. Scott of J. I. Case Threshing Machine Company, Racine, Wis., and secretary, H. E. Field of Farrel Foundry & Machine Company, Ansonia, Conn.

The regular business was then resumed under the direction of President Walker. The afternoon was devoted to a visit to the Allis-Chalmers plant at West Allis.

Boiler makers at Youngstown, Ohio, have demanded the Pittsburgh scale, which calls for $4 per day for an eight-hour day for outside men. The new scale will be presented to the boiler manufacturers at Youngstown within a few days. The Youngstown district is composed of Youngstown, New Castle, Alliance, Warren, Niles, Lowellville and other points.

The Cape Ann Tool Company, Pigeon Cove, Mass., drop forgers, have plans drawn for the immediate erection of an addition to their plant 70 x 72 feet, one story. Among the new equipment required will be six drop hammers, one large hack saw and one 115 horse-power boiler.

The Northampton Emery Wheel Company, Leeds, Mass., manufacturers of grinding machinery, have appointed Willard S. Paden Eastern sales agent, with office at their works at Leeds, Mass. Mr. Paden has represented the company in the West for a number of years.

No. 2 blooming mill at the Shoenberger plant of the American Steel & Wire Company has broken down. It will take two weeks to replace the broken bed plate.

The Iron and Metal Trades.

Our monthly blast furnace statistics are unusually interesting, because they show that we are proceeding at a record breaking pace. In May this country produced 1,758,000 tons of Pig Iron, as compared with 1,646,000 tons in April. This is an increase of over 50,000 tons, taking into account that May had 31 days. Of this enormous total the Steel companies produced 1,033,000 tons in May, against 963,000 tons in April.

The productive capacity has, however, been further enlarged during May, so that the whole active furnace plant of the country is now getting close to a rate of 400,000 tons per week, which seems a staggering quantity for the consumption to take care of.

During May there was an accumulation of stocks of about 35,000 tons of Coke Iron and 5000 tons of Charcoal Iron, which is about the rate at which belated foreign Pig Iron has been coming in. This would look as though consumption is now very close to the actual rate of output, but with the promise of a further expansion of production the latter seems a little too large. The margin is a perilously narrow one.

There are indications that large interests are quietly testing the market in the hope of securing supplies for the second half of the year at figures considerably below the present range. As yet, however, nothing has been done. There has been somewhat more buying lately, but it is still far below the normal.

The Southern situation does not seem to have been cleared. Outside furnace interests are again underselling the official prices, without, however, marketing much.

The tidewater Steel market is easier, owing to somewhat lower offerings of foreign Billets.

Some good orders for Steel Rails have been placed in the West and further transactions are pending. In the East the market is quiet.

The endless chicanery of the labor unions is having its effect upon the tonnage which is being placed in manufactured Iron and Steel. On the whole it is not so satisfactory as it should be, although the leading interest reports an exceptional amount of work in Tubes, Tin Plate and some other branches.

The Plate manufacturers at a recent meeting reaffirmed prices, but it is admitted that the demand is not quite as heavy as it has been.

There has been some further weakness in Iron Bars, both East and West, but notably in the West the concessions made have led to the placing of some good orders.

The market for Old Material has displayed further symptoms of weakness, particularly for all such Scrap as is used for rerolling. The demand from the rolling mills has fallen to a low ebb. Steel Melting Scrap, on the other hand, continues strong and in good request.

A Comparison of Prices.

Advances Over the Previous Month in Heavy Type. Declines in Italics.

At date, one week, one month and one year previous.

	June 11, 1903.	June 3, 1903.	May 13, 1903.	June 11, 1902.
PIG IRON:				
Foundry Pig No. 2, Standard, Philadelphia	*$19.25*	$19.50	$20.25	$20.50
Foundry Pig No. 2, Southern, Cincinnati	*17.75*	18.25	19.25	19.75
Foundry Pig No. 2, Local, Chicago	*19.50*	20.00	20.00	21.50
Bessemer Pig, Pittsburgh	*19.85*	19.85	20.00	21.75
Gray Forge, Pittsburgh	*19.25*	19.25	19.75	20.00
Lake Superior Charcoal, Chicago	24.00	24.00	24.00	23.00
BILLETS, RAILS, ETC.:				
Steel Billets, Pittsburgh	*29.00*	29.00	30.50	32.25
Steel Billets, Philadelphia	27.50	28.50	28.50	....
Steel Billets, Chicago	*30.50*	31.50	32.50	....
Wire Rods, Pittsburgh	37.00	37.00	37.00	37.00
Steel Rails, Heavy, Eastern Mill	28.00	28.00	28.00	28.00
OLD MATERIAL:				
O. Steel Rails, Chicago	*17.00*	17.00	18.25	19.00
O. Steel Rails, Philadelphia	*21.00*	21.00	21.50	21.00
O. Iron Rails, Chicago	*21.50*	22.50	24.00	24.00
O. Iron Rails, Philadelphia	*24.00*	24.00	24.50	24.50
O. Car Wheels, Chicago	*22.00*	22.00	23.00	20.50
O. Car Wheels, Philadelphia	*22.00*	22.50	24.00	19.50
Heavy Steel Scrap, Pittsburgh	....	....	21.50	....
Heavy Steel Scrap, Chicago	*16.50*	16.50	18.25	19.00
FINISHED IRON AND STEEL:				
Refined Iron Bars, Philadelphia	*1.80*	1.85	1.85	2.00
Common Iron Bars, Chicago	*1.75*	1.75	1.80	1.75
Common Iron Bars, Pittsburgh	...	1.80	1.85	1.80
Steel Bars, Tidewater	1.75	1.75	1.75	1.90
Steel Bars, Pittsburgh	1.60	1.60	1.60	1.60
Tank Plates, Tidewater	1.75	1.75	1.80	2.00
Tank Plates, Pittsburgh	1.60	1.60	1.60	1.60
Beams, Tidewater	1.73½	1.73½	1.73½	2.00
Beams, Pittsburgh	1.60	1.60	1.60	1.60
Angles, Tidewater	1.73½	1.73½	1.73½	2.00
Angles, Pittsburgh	1.60	1.60	1.60	1.60
Skelp, Grooved Iron, Pittsburgh	*1.90*	1.90	2.05	2.15
Skelp, Sheared Iron, Pittsburgh	*2.00*	2.00	2.10	2.35
Sheets, No. 27, Pittsburgh	2.65	2.65	2.65	2.90
Barb Wire, f.o.b. Pittsburgh	2.60	2.60	2.60	2.90
Wire Nails, f.o.b. Pittsburgh	2.00	2.00	2.00	2.05
Cut Nails, f.o.b. Pittsburgh	2.15	2.15	2.15	2.05
METALS:				
Copper, New York	*14.50*	14.75	14.75	12.25
Spelter, St. Louis	**5.60**	5.50	5.40	4.65
Lead, New York	4.37½	4.37½	4.37½	4.10
Lead, St. Louis	*4.15*	4.15	4.22½	4.10
Tin, New York	*28.00*	28.50	29.65	30.50
Antimony, Hallett, New York	7.00	7.00	7.00	8.00
Nickel, New York	40.00	40.00	40.00	50.00
Tin Plate, Domestic, Bessemer, 100 pounds, New York	3.99	3.99	3.99	4.19

Chicago.

FISHER BUILDING, June 10, 1903.—(*By Telegraph.*)

With the exception of Rails and Plates, the sales of which have been largely increased, the tonnage of Steel changing hands has been relatively light, but there has been a better inquiry for Black Sheets and some little improvement in the demand for agricultural shapes, and more implement dealers have closed small contracts for the season's requirements. Structural Material has been especially dull. Steel Bars have been well sustained, but Bar Iron has suffered a further decline, car manufacturers having made some contracts at lower prices. Old Material has again come prominently forward during the week, with another drop in prices ranging from 50c. to $2 per ton. Large buyers of Pig Iron have not been stirred to action by the establishment of prices for the last half of the year by the Southern associated furnaces, but some important buyers are in the market for Foundry Basic and Bessemer grades for delivery during the last half of the year. Sales during the week, however, have been mainly for quick shipment, with one or two transactions for the third quarter. Coke has continued to be freely offered, the tendency being still toward lower prices.

Pig Iron.—The official sanction to the basis of $15 for No. 2, or $14.50 for No. 3 Foundry, Birmingham, by the Southern Association furnaces has not stimulated buying in this market. On the contrary, consumers have persisted in their previous policy of demanding concessions from the prices asked by furnaces. However, quite a number of large buyers are in the market, and within the course of a few weeks a large volume of business is anticipated. Several lots of 500 tons each of No. 2 Foundry have been sold

The National Machine Tool Builders' Association.

(By Telegraph.)

Early Wednesday morning the various committees designated to discuss conditions in the different branches of the trade assembled and studied the problems confronting them until 11 o'clock, when they repaired to the Worcester Board of Trade rooms to report to the convention.

The meeting was an executive session, a considerable portion of the time being consumed in the discussion of the apprenticeship problem. This subject was opened by W. A. Viall of the Brown & Sharpe Mfg. Company of Providence, R. I., who described the apprenticeship system in operation at the Providence plant. He said that the applicants must be not less than 16 nor more than 18 years of age. They must be physically sound, of good moral character, and have received an education equivalent at least to that required for graduation from the public grammar schools of the City of Providence. Application must be made in person; and, if accepted, the applicant's name will be registered and due notice given when he will be required to commence work. The first 480 hours of service shall constitute a term of trial. If the apprentice shall, during this term, prove satisfactory, and shall, before the expiration thereof, execute, together with his father or guardian—or if he have no father or guardian, then with some other responsible party—an agreement, then his apprenticeship shall continue for the full term, unless sooner terminated as thereinafter stated. The agreement provides for the payment of a bonus of $50 to the apprentice at the expiration of the trial term and $150 at the expiration of the full term of four years.

Apprentices will be required to serve for the term of four years, each year to consist of 2950 working hours, which with the usual working day of ten hours each, is equal to 295 working days. The remaining working days in each year will be allowed apprentices for recreation, at such time or times as the company shall direct. Graduates of the Providence Manual Training High School well recommended by the principal may have their term of apprenticeship shortened at the discretion of the company.

Apprentices will be required to perform their duties with punctuality, diligence and fidelity, and to conform to the rules and regulations which are or may be adopted for the government of the shops.

Apprentices are not allowed to use tobacco in the shops during working hours.

Apprentices shall make up lost time at the expiration of each year at the rate of wages paid during said year; and no year of service shall commence until the apprentice shall have fully made up all time lost in the preceding year.

The company reserve the right, whenever the state of business demands it, to shorten the hours of labor, or whenever for any reason they shall stop the work, to suspend apprentices wholly or in part, and the making up of time so lost shall be at the discretion of the company.

The company also reserve the right, in their sole discretion, to terminate their agreement with any apprentice, also to discharge him from their employment for nonconformity with their rules and regulations, want of industry or capacity, indifference to his duties or improper conduct within or without the shops.

Apprentices will be paid for each hour of actual service (not including time allowed for recreation or time when work is suspended) the following wages: For the first year, 6 cents; for the second year, 8 cents; for the third year, 10 cents, and for the fourth year, 14 cents. If the company shall terminate the apprenticeship during the time of trial it will pay at the rate of 6 cents per hour for the time worked. Wages will be paid on the regular pay days of the company, as they may be established from time to time. The company will faithfully instruct the apprentice in the machinists' art and trade in their shops during the term of apprenticeship.

The consensus of opinion among the delegates was that a scarcity of apprentices exists in the machine shops of this country, and that steps should be taken to carry more of them at the various plants. Several of the members voiced sentiments to the effect that the terms of apprenticeship should vary in the different industrial districts. It was held that while the terms in force at the Brown & Sharpe shop were excellent for New England they were not exactly suited to other fields, as, for instance, the Cincinnati territory or Western sections.

The delegates indorsed the terms suggested by a prominent machine tool builder at the recent Buffalo meeting of the National Metal Trades Association which were printed in *The Iron Age* at the time.

The members of the association and their guests were entertained at luncheon Wednesday by the Norton Emery Wheel Company at their plant at Barber's Crossing, every one availing himself of the opportunity to look over these works and the shops of the Norton Grinding Company. A special electric car took the party to Barber's Crossing, with Charles T. Allen, secretary of the company, as their cicerone. An excellent luncheon was enjoyed, after which the works were inspected. An exceedingly interesting feature of the visit was a demonstration of some of the latest grinding methods, with an attractive display of ground parts at the Norton Grinding Company's new shop. The new very heavy type of Norton grinder was inspected. The visitors were loud in their expressions of appreciation of the manner of their entertainment.

There was unanimous indorsement of the words of A. H. Tuechter and Harry Hoeffinghoff of Cincinnati, when they exclaimed, "Genuine Worcester hospitality!" From the time the visitors arrived they were in the hands of kindly and generous hosts. The general entertainment was supplemented by little excursions and visits to manufacturing establishments. One little outing greatly appreciated by Western members was a genuine clam bake yesterday noon at the Elk House, at Lake Quinsigamond. It was a frequent expression that Worcester would be a good place for another meeting in the near future, and votes of thanks were passed without the usual savor of perfunctoriness.

American Foundrymen's Association.

(By Telegraph.)

Wednesday morning session was largely devoted to the Metallurgical Section. R. F. Flinterman of the McCormick division of the International Harvester Company, Chicago, Ill., was called upon to preside, and a number of papers of special interest to this section were presented and discussed.

Recommendations of permanent officers for the section were made to the Committee on Nomination of Officers as follows: Chairman, W. G. Scott of J. I. Case Threshing Machine Company, Racine, Wis., and secretary, H. E. Field of Farrel Foundry & Machine Company, Ansonia, Conn.

The regular business was then resumed under the direction of President Walker. The afternoon was devoted to a visit to the Allis-Chalmers plant at West Allis.

Boiler makers at Youngstown, Ohio, have demanded the Pittsburgh scale, which calls for $4 per day for an eight-hour day for outside men. The new scale will be presented to the boiler manufacturers at Youngstown within a few days. The Youngstown district is composed of Youngstown, New Castle, Alliance, Warren, Niles, Lowellville and other points.

The Cape Ann Tool Company, Pigeon Cove, Mass., drop forgers, have plans drawn for the immediate erection of an addition to their plant 70 x 72 feet, one story. Among the new equipment required will be six drop hammers, one large hack saw and one 115 horse-power boiler.

The Northampton Emery Wheel Company, Leeds, Mass., manufacturers of grinding machinery, have appointed Willard S. Paden Eastern sales agent, with office at their works at Leeds, Mass. Mr. Paden has represented the company in the West for a number of years.

No. 2 blooming mill at the Shoenberger plant of the American Steel & Wire Company has broken down. It will take two weeks to replace the broken bed plate.

The Iron and Metal Trades.

Our monthly blast furnace statistics are unusually interesting, because they show that we are proceeding at a record breaking pace. In May this country produced 1,758,000 tons of Pig Iron, as compared with 1,646,000 tons in April. This is an increase of over 50,000 tons, taking into account that May had 31 days. Of this enormous total the Steel companies produced 1,033,000 tons in May, against 963,000 tons in April.

The productive capacity has, however, been further enlarged during May, so that the whole active furnace plant of the country is now getting close to a rate of 400,000 tons per week, which seems a staggering quantity for the consumption to take care of.

During May there was an accumulation of stocks of about 35,000 tons of Coke Iron and 5000 tons of Charcoal Iron, which is about the rate at which belated foreign Pig Iron has been coming in. This would look as though consumption is now very close to the actual rate of output, but with the promise of a further expansion of production the latter seems a little too large. The margin is a perilously narrow one.

There are indications that large interests are quietly testing the market in the hope of securing supplies for the second half of the year at figures considerably below the present range. As yet, however, nothing has been done. There has been somewhat more buying lately, but it is still far below the normal.

The Southern situation does not seem to have been cleared. Outside furnace interests are again underselling the official prices, without, however, marketing much.

The tidewater Steel market is easier, owing to somewhat lower offerings of foreign Billets.

Some good orders for Steel Rails have been placed in the West and further transactions are pending. In the East the market is quiet.

The endless chicanery of the labor unions is having its effect upon the tonnage which is being placed in manufactured Iron and Steel. On the whole it is not so satisfactory as it should be, although the leading interest reports an exceptional amount of work in Tubes, Tin Plate and some other branches.

The Plate manufacturers at a recent meeting reaffirmed prices, but it is admitted that the demand is not quite as heavy as it has been.

There has been some further weakness in Iron Bars, both East and West, but notably in the West the concessions made have led to the placing of some good orders.

The market for Old Material has displayed further symptoms of weakness, particularly for all such Scrap as is used for rerolling. The demand from the rolling mills has fallen to a low ebb. Steel Melting Scrap, on the other hand, continues strong and in good request.

A Comparison of Prices.

Advances Over the Previous Month in Heavy Type. Declines in Italics.

At date, one week, one month and one year previous.

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Bessemer Pig, Pittsburgh	*19.85*	19.85	20.00	21.75
Gray Forge, Pittsburgh	*19.25*	19.25	19.75	20.00
Lake Superior Charcoal, Chicago	24.00	24.00	24.00	23.00
BILLETS, RAILS, ETC.:				
Steel Billets, Pittsburgh	*29.00*	29.00	30.50	32.25
Steel Billets, Philadelphia	27.50	28.50	28.50	....
Steel Billets, Chicago	*30.56*	31.50	32.50	....
Wire Rods, Pittsburgh	37.00	37.00	37.00	37.00
Steel Rails, Heavy, Eastern Mill	28.00	28.00	28.00	28.00
OLD MATERIAL:				
O. Steel Rails, Chicago	*17.00*	17.00	18.25	19.00
O. Steel Rails, Philadelphia	*21.00*	21.00	21.50	21.00
O. Iron Rails, Chicago	*21.50*	22.50	24.00	24.00
O. Iron Rails, Philadelphia	*24.00*	24.00	24.50	24.50
O. Car Wheels, Chicago	*22.00*	22.00	23.00	20.50
O. Car Wheels, Philadelphia	*22.00*	22.50	24.00	19.50
Heavy Steel Scrap, Pittsburgh	....	....	21.50	....
Heavy Steel Scrap, Chicago	*16.50*	16.50	18.25	19.00
FINISHED IRON AND STEEL:				
Refined Iron Bars, Philadelphia	*1.80*	1.85	1.85	2.00
Common Iron Bars, Chicago	*1.75*	1.75	1.80	1.75
Common Iron Bars, Pittsburgh	...	1.80	1.85	1.80
Steel Bars, Tidewater	1.75	1.75	1.75	1.90
Steel Bars, Pittsburgh	1.60	1.60	1.60	1.60
Tank Plates, Tidewater	1.75	1.75	1.80	2.00
Tank Plates, Pittsburgh	1.60	1.60	1.60	1.60
Beams, Tidewater	1.73½	1.73½	1.73½	2.00
Beams, Pittsburgh	1.60	1.60	1.60	1.60
Angles, Tidewater	1.73½	1.73½	1.73½	2.00
Angles, Pittsburgh	1.60	1.60	1.60	1.60
Skelp, Grooved Iron, Pittsburgh	*1.90*	1.90	2.05	2.15
Skelp, Sheared Iron, Pittsburgh	*2.00*	2.00	2.10	2.35
Sheets, No. 27, Pittsburgh	2.65	2.65	2.65	2.90
Barb Wire, f.o.b. Pittsburgh	2.60	2.60	2.60	2.90
Wire Nails, f.o.b. Pittsburgh	2.00	2.00	2.00	2.05
Cut Nails, f.o.b. Pittsburgh	2.15	2.15	2.15	2.05
METALS:				
Copper, New York	*14.50*	14.75	14.75	12.25
Spelter, St. Louis	**5.60**	5.50	5.40	4.65
Lead, New York	4.37½	4.37½	4.37½	4.10
Lead, St. Louis	*4.15*	4.15	4.22½	4.10
Tin, New York	*28.00*	28.50	29.65	30.50
Antimony, Hallett, New York	7.00	7.00	7.00	8.00
Nickel, New York	40.00	40.00	40.00	50.00
Tin Plate, Domestic, Bessemer, 100 pounds, New York	3.99	3.99	3.99	4.19

Chicago.

FISHER BUILDING, June 10, 1903.—(*By Telegraph.*)

With the exception of Rails and Plates, the sales of which have been largely increased, the tonnage of Steel changing hands has been relatively light, but there has been a better inquiry for Black Sheets and some little improvement in the demand for agricultural shapes, and more implement dealers have closed small contracts for the season's requirements. Structural Material has been especially dull. Steel Bars have been well sustained, but Bar Iron has suffered a further decline, car manufacturers having made some contracts at lower prices. Old Material has again come prominently forward during the week, with another drop in prices ranging from 50c. to $2 per ton. Large buyers of Pig Iron have not been stirred to action by the establishment of prices for the last half of the year by the Southern associated furnaces, but some important buyers are in the market for Foundry Basic and Bessemer grades for delivery during the last half of the year. Sales during the week, however, have been mainly for quick shipment, with one or two transactions for the third quarter. Coke has continued to be freely offered, the tendency being still toward lower prices.

Pig Iron.—The official sanction to the basis of $15 for No. 2, or $14.50 for No. 3 Foundry, Birmingham, by the Southern Association furnaces has not stimulated buying in this market. On the contrary, consumers have persisted in their previous policy of demanding concessions from the prices asked by furnaces. However, quite a number of large buyers are in the market, and within the course of a few weeks a large volume of business is anticipated. Several lots of 500 tons each of No. 2 Foundry have been sold

at $15, Birmingham, for September and October delivery, and some for shipment beginning in July, extending forward several months. But in the main purchases have been confined to small lots, ranging from 50 to 200 tons each, for prompt shipment, and mainly of the lower grades, especially Mill Iron, Soft Foundry grades and High Silicon Iron. Implement manufacturers, Pipe works, radiator manufacturers, machine shops and general foundries are among the buyers in the market. Malleable foundries are expected to close considerable contracts within a few weeks. The demand for Basic and other Low Phosphorus Iron noted a week ago has not yet been satisfied, but neither furnaces nor consumers seem disposed to press the closing of contracts. Basic Iron is low, offered at $15.50 to $16 at Birmingham, and $1 higher at Virginia furnaces, equivalent to $19.85 to $20.35, Chicago, and Malleable Bessemer is obtainable at $19.50 to $20, Chicago, for the last half of the year. Prices are revised as follows, the inside prices being for the last half and the outside for immediate shipment, f.o.b. Chicago:

Lake Superior Charcoal	$24.00 to $25.00
Local Coke Foundry, No. 1	20.50 to 21.00
Local Coke Foundry, No. 2	19.50 to 20.00
Local Coke Foundry, No. 3	19.00 to 19.50
Local Scotch, No. 1	21.50 to 22.00
Ohio Strong Softeners, No. 1	21.00 to 21.50
Ohio Strong Softeners, No. 2	20.50 to 21.00
Southern Silvery, according to Silicon	20.60 to 21.50
Southern Coke, No. 1	19.85 to 20.35
Southern Coke, No. 2	19.35 to 19.85
Southern Coke, No. 3	18.85 to 19.35
Southern Coke, No. 1 Soft	19.85 to 20.30
Southern Coke, No. 2 Soft	19.35 to 19.85
Foundry Forge	18.85 to 19.35
Southern Gray Forge	18.35 to 18.85
Southern Mottled	18.10 to 18.35
Southern Charcoal Softeners, according to Silicon	23.85 to 24.85
Alabama and Georgia Car Wheel	27.85 to 28.85
Malleable Bessemer	19.50 to 20.00
Standard Bessemer	20.00 to 20.50
Jackson County and Kentucky Silvery, 6 to 8 per cent. Silicon	25.30 to 26.30

Bars.—The situation as far as Steel Bars is concerned has not changed essentially during the week. New business has been light, but new contracts for about 13,000 tons were closed during the month of May and specifications on old commitments since have increased materially. Bar Iron has been in better demand and easier, with rumors of sales of round lots to car works at concessions, but not verified, the most important contract closed being one of 3000 tons. Sales have been mainly at 1.75c. to 1.80c., base, Chicago. The following are the prices current, f.o.b. cars, Chicago, mill shipment: Bar Iron, 1.75c. to 1.80c.; Soft Steel Bars, 1.76½c. to 1.86½c.; Hoops, 2.16½c. to 2.26½c.; Angles, under 3 inches, 1.86½c. to 1.91½c., base. There has been only a moderate demand for shipment from local stocks and the market has been easier, with lower prices accepted for Small Angles. The followirg are the prices current: Bar Iron, 2c. to 2.15c.; Soft Steel Bars, 2c. rates; Angles, 3 inches and under, 2.10c. rates, and Hoops, 2.40c., base, from store.

Structural Material.—Dullness has been the most prominent feature of the market, there being little business offering of any kind; but there is considerable bridge material and other railroad work pending. Shipments as a rule are now being made promptly, but the market remains steady, prices being as follows: Beams, Channels and Zees, 15 inches and under, 1.75c. to 1.90c.; 18 inches and over, 1.85c. to 2c.; Angles, 1.75c. to 1.90c. rates; Tees, 1.80c. to 1.90c.; Universal Plates, 2c. to 2.25c. A few local jobbers have continued to draw a fair number of small orders, but as a rule the market is quiet and prices have remained steady, as follows: Beams and Channels, 2¼c. to 2½c.; Angles, 2.25c. to 2.50c.; Tees, 2.30c. to 2.55c., at local yards.

Plates.—There has been an improved demand and larger sales have followed from the fact that mills are able to make prompter shipments. Contracts for about 9000 tons in lots of 1000 to 3000 tons each have been closed for shipment during the early fall. The market remains steady, prices being unchanged, as follows, f.o.b. cars, Chicago, mill shipment: Tank Steel, ¼-inch and heavier, 1.75c. to 2c.; Flange, 1.85c. to 2.15c.; Marine, 1.95c. to 2.10c. Local stocks are liberal and the moderate demand is readily met at previous prices: Steel, ¼-inch and heavier, 2.15c. to 2.20c; Tank Steel, 3-16-inch, 2.25c. to 2.30c.; No. 8, 2.30c. to 2.40c.; Flange Steel, 2.40c. to 2.50c., all f.o.b. warehouse, Chicago.

Sheets.—There has been an increased demand for both Black and Galvanized Sheets, several lots of 200 to 300 tons each having been closed during the past few days and several lots of 1000 to 1200 tons each for future delivery pending. In a few instances quotations on Black Sheets have been shaded, but for small lots prices have been well sustained. The following are the prices current for Black Sheets, carload lots, Chicago, mill shipment: No. 10, 2.12½c. to 2.16½c.; No. 12, 2.22½c. to 2.26½c.; No. 14, 2.32½c. to 2.36½c.; No. 16, 2.42½c. to 2.46½c.; Nos. 18 and 20, 2.56½c. to 2.60½c.; Nos. 22 and 24, 2.66½c. to 2.70½c.; No. 26, 2.76½c. to 2.80½c.; No. 27, 2.86½c. to 2.90½c.; No. 28, 2.96½c. to 3.00½c. From store sales are made at 10c. to 15c. above mill prices. Galvanized Sheets have been in better demand, with sales at 75 and 10 and 2½ to 75 and 10 discount, Pittsburgh, and 75 and 5, Chicago, for mill shipment. Sales from local stocks continue to be made on the basis of 75 and 2½ to 75 discount.

Cast Pipe.—There has been some little increase in the current order trade from railroad and mining companies, water and gas works, but the market has been a little easier in tone. There are several municipal contracts pending, ranging from 1200 to 2000 tons each, which will be closed within the next few days. The only sale of moment during the last few days has been 1000 tons of large size Culvert Pipe for delivery at Omaha. Manufacturers meet the current order demand for small lots at the following prices, f.o.b. cars, Chicago: 4-inch, $33; 6-inch, $32; 8-inch, $31.50, and larger, $31 for Water, and $1 per ton higher for Gas Pipe.

Billets.—There is a moderate demand for both Open Hearth and Forging Billets, with only moderate offerings, and prices are little better than nominal on the basis of $30.50 to $31.50 for domestic Rerolling Bessemer Billets and $33 to $38 for Open Hearth Forging Billets, according to analysis, buyer and time of delivery. For small lots $1 to $2 per ton over these prices is charged.

Merchant Pipe.—While the demand from the flooded sections of the Missouri and Mississippi valleys has fallen off somewhat, the aggregate volume of business has increased rather than otherwise, and the market remains steady as previously quoted for the smaller and medium sizes. Large sizes are difficult to obtain. There continues to be a good demand for Line Pipe and Casing in the gas belt and the market is firm in tone. Prices remain unchanged, the following being the schedule of discounts for carload lots, Chicago, base, random lengths, mill shipment:

	Steel Pipe.		Guaranteed Wrought Iron.	
	Black. Per cent.	Galvd. Per cent.	Black. Per cent.	Galvd. Per cent.
⅛ to ⅜ inch	66.35	56.35	63.35	53.35
½ inch	68.35	58.35	65.35	55.35
¾ to 6 inches	73.35	63.35	70.35	60.35
7 to 12 inches	67.35	57.35	64.35	54.35

Less than carloads, 12½ per cent. advance.

Boiler Tubes.—Mills are well supplied with orders, and new business continues satisfactory, the market being firm in tone. The following schedule of discounts prevails:

	Steel.	Iron.
1 to 1½ inches	43.35	38.35
1¾ to 2½ inches	55.85	35.85
2¾ to 5 inches	60.85	45.85
6 inches and larger	55.85	35.85

Less than carloads, 12½ per cent. advance.

Local distributers have continued to receive a fair number of small orders and the market has remained steady, the following being the discounts for shipment from local stocks:

	Steel.	Iron.
1 to 1½ inches	40	35
1¾ to 2½ inches	50	32½
2¾ to 5 inches	57½	42½
6 inches and larger	50	..

Merchant Steel.—There has been some little increase in the demand for Agricultural Springs, Rounds and Disks, several small contracts for season's requirements having been closed during the past few days. Tool Steel has been quiet, but the market has shown little change in the general features. Prices have remained steady at Chicago, being as follows for mill shipment: Smooth Finished Machinery Steel, 2.01½c. to 2.11½c.; Smooth Finished Tire, 1.96½c. to 2.11½c.; Open Hearth Spring Steel, 2.66½c. to 2.76½c.; Toe Calk, 2.31½c. to 2.46½c.; Sleigh Shoe, 1.86½c. to 1.96½c.; Cutter Shoe, 2.41½c. to 2.61½c. Ordinary grades of Crucible Tool Steel are quoted at 6c. to 8c. for mill shipment; Specials, 12c. upward. Cold Rolled Shafting in carload lots sells at 47 and in less than carload lots at 42 discount from list.

Rails and Track Supplies.—There has been an increased demand for Standard Rails, sales during the week aggregating about 20,000 tons, with another lot of 10,000 tons pending for shipment during the fall months. Light Rails have also been in good demand, sales aggregating several thousand tons for quick shipment. The market has continued strong in tone, official prices being unchanged at $28 for standard and $27 for second quality, mill shipment. Light Rails are selling at $35 to $40, according to weight. Track Supplies have been in good demand and the market has remained steady. The following are the prices current at Chicago for mill shipment: Splice or Angle Bars, 2c. to 2.10c.; Spikes, 2.10c. to 2.15c.; Track Bolts, 3½ to 3¾ inches and larger, with Square Nuts, 2.85c. to 2.90c.; with Hexagon Nuts, 3c. to 3.10c. From store, 10c. to 15c. over mill prices are asked and obtained.

Old Material.—The offerings of all kinds have increased and in some cases there has been urgency to sell, resulting in still lower prices; yet there has been more material changing hands at the lower level. Among the sales have been 6000 tons of Steel Car Axles on the basis of quotations.

Railroad grades have been especially heavy. Old Iron Rails, Fish Plates, Iron and Steel Car Axles and Railroad Wrought have dropped from 50c. to $1.50 per ton. Dealers' Forge, Busheling, Borings and Heavy Cast Scrap have also suffered more or less. The following are the prices current per gross ton, Chicago:

Old Iron Rails	$21.50 to $22.00
Old Steel Rails, mixed lengths	17.00 to 17.50
Old Steel Rails, long lengths	22.00 to 22.50
Heavy Relaying Rails	31.00 to 31.50
Old Car Wheels	22.00 to 22.50
Heavy Melting Steel Scrap	16.50 to 17.00
Mixed Steel	14.50 to 15.00

The following quotations are per net ton:

Iron Fish Plates	$18.00 to $18.50
Iron Car Axles	22.00 to 23.00
Steel Car Axles	21.00 to 22.00
No. 1 Railroad Wrought	16.50 to 17.00
No. 2 Railroad Wrought	15.00 to 16.00
Shafting	18.00 to 19.00
No. 1 Dealers' Forge	14.00 to 15.00
No. 1 Busheling and Wrought Pipe	13.00 to 13.50
Iron Axle Turnings	13.00 to 13.50
Soft Steel Axle Turnings	13.00 to 13.50
Machine Shop Turnings	12.75 to 13.00
Cast Borings	7.00 to 8.00
Mixed Borings, &c	.... to 10.00
No. 1 Boilers, cut	13.00 to 13.50
Heavy Cast Scrap	15.00 to 15.50
Stove Plate and Light Cast Scrap	.... to 10.00
Railroad Malleable	15.00 to 16.00
Agricultural Malleable	14.00 to 14.50

Metals.—There has been a quieter and easier market for Copper, prices being about ¼c. lower than a week ago. Casting Copper is offered at 14¼c. and Lake at 14⅜c., Chicago. Pig Lead has been in fair demand for early shipment, but under present conditions prices in this market remain nominal at 4.30c. in lots of 50 to 100 tons. Spelter has continued active and stronger in tone, sales being made at 5.50c. to 5.55c. in carload lots for Slabs. Sheet Zinc is scarce and nominally held at 8c., Chicago, in a jobbing way. Old Metals have been slow and easier in tone, Red Brass being especially dull. Heavy Cut Copper sells at 12c., Red Brass at 11¼c., Copper Bottoms at 10⅞c., Lead Pipe at 4c. and Lead at 4.25c., spot.

Coke.—The market has continued slow and easy under free offerings and only a moderate demand for spot supplies, but there is a better inquiry for Furnace, with some business of moment pending for the last half of the year. Furnace Coke is quotable at $2.50 to $3, and Standard Foundry Coke at $3.50 to $4 at the ovens. Sales of Standard Foundry Coke have been made at $5.65 to $6.65, spot track, Chicago.

Philadelphia.

FORREST BUILDING, June 9, 1903.

The situation in the Iron market is not satisfactory by any means, although there are some people who regard present conditions as preliminary to considerable activity at a later date. Optimistic views were so amply vindicated during the past three or four years, that with many people there is considerable timidity in expressing contrary opinions, although it is perfectly obvious that there is a change of sentiment which it is to be feared is not altogether groundless. Whatever the future may be, it is clear that at the present time business is dull, prices are weak and prospects of betterment in the near future are not encouraging. The ultimate outcome must, of course, be determined by developments which may arise from present conditions. The question to be considered therefore is whether these are such as give reasonable promise of improvement. It must be at once confessed that it is no easy matter to build up any convincing theory that improvement is likely to be merely a question of some brief period of time. There are some good features, of course, the most prominent being the small quantity of Iron held in stock. There can be no serious break in prices while that continues, so that the first thing to be considered is what are the chances as regards increase or decrease. The monthly report of the condition of furnaces, which will presumably be published in this issue of *The Iron Age*, will call the turn of the market for the next three or four weeks, but what the report will be is at the moment unknown to the writer, hence the necessity for caution in making forecasts. It is believed, however, that there will be some increase in production and some increase in stocks, but in the absence of actual figures it would be useless to anticipate the matter. Still, the easiness in prices is usually an indication of larger supplies or of smaller requirements, but which of these it is that affects prices remains to be seen. The demand for Iron and Steel of every description is, however, phenomenally light. In the usual sense of the word there is no business worth talking about. It is not a question of prices, it is simply a want of confidence. Those who need Iron make no objection to prices, but those who can pull through a few weeks longer without placing orders show no disposition to consider the matter seriously, mainly because of unsettled conditions, apart from the Iron trade proper. The floods in the West and in the South, the unsettled condition of labor and the money markets are features of grave import, and until these are at least measurably settled it would be of doubtful propriety to be optimistic in regard to the Iron trade or any of its kindred interests. Things may be a great deal better in a month or six weeks' time, but as regards the present there is ample reason for extreme caution.

Pig Iron.—It is something to be able to say that the Pig Iron trade is no worse than it was a week ago, in some respects it may be a shade better. The demand was small last week, it is small this week, but the fact that deliveries are being called for with somewhat more urgency suggests the possibility that the statistical situation may prove to be better than has been expected. Furnace agents say that Iron is not accumulating, and while they would be well pleased to secure a good line of business for deliveries during the last half of the year, they have very little Iron for spot delivery. This may be significant or it may not be, but it is one of the straws that will bear watching. Prices appear to be just what they were a week ago. Some brands of No. 2 X Foundry command $20.25 to $20.50 delivered, but there are others at $19.50 to $20; but no large sales appear to have been made at any price. Buyers appear to be perfectly indifferent as regards extended deliveries, and it is clear that at present $19.50 is not low enough to attract large buyers. These conditions are likely enough to continue until after the holidays, and if prices are no lower by that time there will be some grounds for expecting that buying will be renewed on a rising market. The only reason for this opinion, however, is as stated—viz.: That if the present level can be maintained a month longer the chances for a decline will be materially lessened. Quotations for city or nearby deliveries are about as follows, but only small lots are taken at the outside figures:

No. 1 X Foundry	$21.00 to $21.50
No. 2 X Foundry	19.50 to 20.50
No. 2 Plain	19.00 to 19.25
Gray Forge	18.00 to 18.50
Basic	19.00 to 19.25
Middlesbrough, No. 3	19.00 to 19.50

Cargo lots c.i.f.:

Low Phosphorus, 0.035	$20.85 to $21.00
Middlesbrough, No. 3	16.75 to 17.00

Steel.—The market is very dull and prices are gradually reaching a lower level. Basic Open Hearth could be had at about $30.50 delivered, but there appear to be no bids for large lots. Canadian Steel could be done at $27.50 or a shade less for round lots, and offerings are more urgent than they have been for a long time past.

Plates.—There is a well distributed demand, and sales during the week aggregate a large tonnage, although most of the lots were for moderate quantities. Prices are unchanged, although fancy quotations are not so much in evidence as formerly, but there is a probability that to-day's prices will be rock bottom figures for some time to come. The Plate Association held their usual monthly meeting in New York City last Thursday, and it was unanimously agreed that 1.60c., at Pittsburgh, should be maintained as a minimum quotation on ordinary ¼-inch Plates, which, at seaboard, is equivalent to last week's figures—viz.: Small lots, 1.90c. to 1.95c.; carload lots, ¼-inch and thicker, 1.75c. to 1.80c.; Universals, 1.80c.; Flange, 1.90c.; Marine, 2c. to 2.05c.; Fire Box, 2.10c. to 2.20c.

Structural Material.—There is a continued feeling of easiness in this department, owing to the numerous strikes which delay the forwarding of specifications. Prospects cannot be regarded as specially favorable, although if there was a general resumption of work in the building trades the mills would have plenty to do. Prices are unchanged—viz.: Beams, Angles or Channels, ordinary sizes, 1.73½c. to 1.80c. for carload lots, with the usual addition for smaller quantities.

Bars.—The situation is one of considerable anxiety, as it is clear that there is not business enough to keep all the mills employed. Some seem inclined to accept business at almost whatever price they can get, while others are determined to consider nothing at less than 1.80c., mill. Others accept that figure delivered, and in some cases it is said that still lower figures have been accepted. Ordinary quotations, however, for city or nearby deliveries may be quoted at 1.80c. to 1.82½c. for Refined Iron, and 1.75c. to 1.80c. for Steel Bars.

Sheets.—The demand is very disappointing, and prospects for the near future are not encouraging, although there is a fair amount of work on the books. Prices are irregular and depend a good deal on quantity and time for delivery.

Old Material.—The demand for Rolling Mill Scrap has dropped off to almost nothing, and what little has been done was at low figures, but bids are absolutely unobtainable for some specialties, so that prices are more or less nominal. Steel Scrap is relatively firm, but $21 appears to be an outside figure for the choicest kind of melting stock. Bids and offers are about as follows for deliveries in buyers' yards:

Old Steel Rails	$21.00 to $21.25
Heavy Steel Scrap	20.50 to 21.00
Low Phosphorus Scrap	28.00 to 29.00
Old Steel Axles	22.00 to 23.00
Old Iron Rails	24.00 to 24.50
Old Iron Axles	27.00 to 28.00
Old Car Wheels	22.00 to 23.00
Choice Scrap, R. R. No. 1 Wrought	20.50 to 21.50
Country Scrap	19.00 to 19.50
Machinery Scrap	18.50 to 19.00
No. 2 Light Scrap	18.00 to 18.50
No. 2 Light (Ordinary)	13.00 to 13.50
Wrought Turnings	15.00 to 16.00
Wrought Turnings, Choice Heavy	16.50 to 17.00
Cast Borings	10.50 to 11.00
Stove Plate	14.50 to 15.00

Cleveland.

CLEVELAND, OHIO, June 9, 1903.

Iron Ore.—The affairs in the Iron Ore trade have settled down for the season and not very much diversity is now being shown in the conditions. A few small sales are being made from time to time, but the buying did not take that spurt which was expected of it after the sale of Bessemer Pig Iron. The furnaces which have not covered completely seem to be those which are engaged in the foundry trade, and the lack of activity in that material makes the purchase of Ore slow. The prices are not changed, being based on a quotation of $4.50 for Bessemer Old Range and $4 for Bessemer Mesaba. The movement down the lake is very heavy. Statistics of the movement for the month of May have just been compiled, showing a total shipment from the upper lake ports of 3,541,357 tons, an increase over the movement for the same month last year of 248,116 tons. The total shipment to June 1 was 4,531,576 tons, which is a decrease from the showing to the same date last year of 626,561 tons, the decrease being due to the late start in April owing to labor difficulties.

Pig Iron.—The demand for Foundry Iron does not seem to have started in active enough yet to warrant any buying of importance for second half delivery. Barring the selling that was done several months ago and which will keep some of the furnaces engaged for a month or so, business for the latter part of the year is confined to moderate sized lots. The inquiries have come in with considerable frequency and indicate a considerable volume of business, but only a few have reached the point where any business is developing. The furnaces are inclined to hold for $20, Valley furnace, for No. 2, but some sales have been made at $19 to $19.50. The attitude of the Southern furnaces is being watched by those in this territory, as the reduction of the price by the association and nonassociation stacks to $15, Birmingham, may topple down the prices here. In Bessemer very little more has been done. The spurt made by the Steel Corporation in buying and that little independent movement which followed seemed to have exhausted the activity for the present, as nothing more of any importance has been done. Basic is inactive because of the big buying hitherto for the second half, and because some of the furnaces are still uncertain as to the amount they will be able to produce. The market is quiet with the price quoted last week being as near as it would be possible to come now—namely, $18.75, Valley furnace. Production of all Iron is heavy and the shipments are free. The supply of Coke is in every instance satisfactory, hence no delay arises from that source.

Finished Iron and Steel.—There is a better tone all through this market. Order booking has been heavy, and the specifications on old contracts have been satisfactory, a considerable contrast, according to reports, with the showing in other vicinities. The weak point in the entire trade has been and is the Bar Iron market. The prices have been sagging considerably and the decline to the basis of Bessemer Steel is not beyond the immediate possibilities. The market has dropped during the week to a quotation of 1.70c., Youngstown, although some mills dispute this. The big mills are indifferent, while the smaller mills are striving to brace the market. It is evident that some tonnage will be withdrawn from the market by the lessening of the price. Bar Steel is in fair demand, with no very strong bull tendencies. The big consumers have not yet bought their supply for the ensuing year, labor difficulties hindering. The prices have not changed, being 1.60c., Pittsburgh, for Bessemer, and 1.70c., Pittsburgh, for Open Hearth. In the Structural trade the market is in much better condition than a short time ago. The deterring influence is still the prolonged labor troubles and the fear of others soon to come. New projects have been showing up lately that would promise a very good business for the last half of the year were it possible to get the work done. At present, however, the mills are able to make deliveries in two or three weeks on almost any sort of an order, which is the dull time limit. The jobbers are getting a little business, but the small mills are deprived of their premium prices. The standard price is 1.60c., Pittsburgh, while the jobbers are getting 2.15c. to 2.25c. out of stock. Plates have been a little more active, and the new business has been coming in fairly well. There is still- nevertheless, a lack of specifications on former contracts, and the market is not firm. The mills are in such a condition that deliveries on Sheared Plates are possible in two weeks to three months, while on Universal Mill such promptness is hardly possible. The smaller mills are still getting a little business at premium prices, which, however, are gradually sagging. The price is now about 1.90c., Cleveland with a few instances in which the mills are still demanding and getting the equivalent of 2c., Cleveland. The standard price which most generally prevails is 1.60c., Pittsburgh. Specifications on former orders have been slow. The Sheet market is still the redeeming feature of the trade. It is evident, however, that some of the business is easing off, especially from the showing made during the month of April. The mills are now able to take care of the business comfortably, and the matter of delivery is not an urgent one. Most of the business of this territory is done out of stock. The prices have not changed, being based on a quotation of 3.10c. to 3.25c. for No. 27 Black Sheets out of stock and 2.85c. to 2.95c. at the mills for the same gauge.

Old Material.—The demand for Scrap is at low ebb. Nothing is being done, and while prices sag they have not changed. They hold at: No. 1 Wrought, $19.50, net; Cast Borings, $12, gross; Car Wheels, $22.50, gross; Heavy Steel, $21, gross; Iron Rails, $25.50, gross; Iron Axles, $27.50, net; Wrought Turnings, $14.50, net; Old Steel Rails, $21, gross.

Cincinnati.

FIFTH AND MAIN STS., June 10, 1903.—(*By Telegraph.*)

The situation in Pig Iron, so far as the Foundry grades are concerned, is perhaps more puzzling to-day than it has been at any time in the recent past. The action of the associated Southern furnaces in reducing the price of Iron has been productive of no immediate result, except to cause the outside furnaces to go 50c. lower in their offers. That kind of tactics, of course, is not very reassuring to the buyers and they are simply in the market for pressing needs and letting to-morrow take care of itself. Some authorities are now saying that a good number of foundries are pretty well supplied with Iron for the next 30 or 60 days. This is owing to the fact that old contracts were delayed in the delivery and shipments are now supplying all immediate wants. There is considerable inquiry, but on the whole buyers are decidedly offish and if they are actually wanting Iron they do not appear to regard either $15 or $14.50, Birmingham, for No. 2 Foundry as a sufficiently stable plane upon which to invest. Just what will come of it all is still in the guessers' realm and nothing definite can be predicted. We find some authorities, usually good, level headed people, who think that Iron will not move at any great rate until after July. Freight rates from the Hanging Rock district, $1.15, and from Birmingham to Ohio River points, $3.25. We quote, f.o.b. Cincinnati, for delivery throughout the year, as follows:

Southern Coke, No. 1	$18.25 to $18.75
Southern Coke, No. 2	17.75 to 18.25
Southern Coke, No. 3	17.25 to 17.75
Southern Coke, No. 4	16.50 to 17.00
Southern Coke, No. 1 Soft	18.25 to 18.75
Southern Coke, No. 2 Soft	17.75 to 18.25
Southern Coke, Gray Forge	16.50 to 17.00
Southern Coke, Mottled	16.50 to 17.00
Ohio Silvery, No. 1	25.15 to 26.15
Lake Superior Coke, No. 1	20.15 to 20.65
Lake Superior Coke, No. 2	19.15 to 19.65
Lake Superior Coke, No. 3	18.15 to 18.65
Car Wheel and Malleable Irons.	
Standard Southern Car Wheel	$26.75 to $27.00
Lake Superior Car Wheel and Malleable	24.75 to 25.25

Hibb & Bauer, Scrap Iron dealers, Cincinnati, Ohio, state that they have no connection whatever with any association of Scrap Iron dealers. They were referred to as members of the Indiana Scrap Iron Dealers' Association in our issue of May 28.

St. Louis.

CHEMICAL BUILDING, June 10, 1903.—(*By Telegraph.*)

Pig Iron.—The revised prices of the Southern furnaces have not yet been productive of any particular changes of an active order in the Pig Iron market at this point. Some new inquiry comes to hand. Orders of large magnitude as yet are conspicuous by their absence. The flood continuations have seriously affected shipments, and the congestion on the east side of the river is great. Consumers will necessarily have to expect considerable delay in the receipt of Iron reported on the road. We quote, f.o.b. St. Louis, as follows:

Southern, No. 1 Foundry	.... to $19.25
Southern, No. 2 Foundry	.... to 18.75
Southern, No. 3 Foundry	.... to 18.25
Southern, No. 4 Foundry	.... to 17.75
No. 1 Soft	.... to 19.25
No. 2 Soft	.... to 18.75
Gray Forge	.... to 17.00

Bars.—Business of a new order has not been considerable the past week in this department, but mills are said

to be supplied with a good tonnage to keep them moving for some time to come. The local jobbers report a fair volume of demand. We quote from the mills: Iron Bars at 1.80c. to 1.85c.; Steel Bars, 1.82½c. to 1.87½c. Jobbing quotations are named at 2.15c. for both Iron and Steel.

Rails and Track Supplies.—This department continues active, and it is expected the demand will be somewhat augmented to repair the damage wrought by the floods to the railroads: We quote as follows: Splice Bars, 2.05c. to 2.25c.; Bolts, with Hexagon Nuts, 3.05c. to 3.25c.; with Square Nuts, 2.90c. to 3.05c.; Spikes, 2.20c. to 2.30c. Jobbers' quotations 10c. to 15c. higher, from store.

Pig Lead.—Business is of a light order, with sellers asking 4.15c. for Missouri brands.

Spelter.—Market conditions are said to be of a quiet but steady order. The price is nominally 5.50c., with offerings of a comparatively light order.

Belgian Iron Market.

BRUSSELS, May 26, 1903.

Our Belgian metallurgical world begins to grow uneasy over the news which are cabled from the United States on the course of business on your side of the Atlantic and which, while sometimes contradictory, are not the less pessimistic. It will be readily understood why we should be uneasy when the fact is recalled that America is regarded here as a giant ready to fall upon the Old World as soon as evil days come. For some time past you have drawn from the European markets a great part of the surplus production, and have thus contributed to help the international market. The quantities furnished by Belgium to the United States have not been very considerable, but when they are compared with those shipped a year ago, the progress made is notable. Below are the exports for the first four months of 1903 and 1902 respectively of the leading products to your country:

	First four months— 1903. Metric tons.	1902. Metric tons.
Pig Iron	1,902	....
Old Material	4,542	....
Steel	50	....
Blooms and Billets	640	....
Muck Bar	700	....
Iron Beams	886	....
Steel Beams	470	169
Steel Rails	15,389	1,272
Plates	32	59
Steel rolled products	1,441	7
Iron rolled products	2,580	233
Iron forgings	238	436
Steel forgings	454	100
Totals	29,324	2,216

If this outlet, which absorbed more than one-ninth of our total exports, were to be lost we would feel it keenly.

Aside from this little black point on the horizon the situation of our Iron industry generally speaking is quite satisfactory. The rolling mills have their order books well supplied for some time to come and are still able to maintain their prices easily. The blast furnaces, too, are working full. Castings are readily maintained at the old prices and Blooms are quoted 100 francs and Billets 105 francs.

The market in Old Material has felt the influence of the important purchases made by America, and prices have risen to limits unattainable for the consuming works here. They do not bear any relation to the prices of finished products. Thus for the month of April the United States have imported from Belgium nearly one-third of the total exports of Old Material, the quantity having been 1300 out of 4400 tons. At the present time, now that the demands from the New World have grown weaker, the dealers want to do business in our home market, but buyers are holding off as much as possible in the hope of leading to a decline in prices.

The market in Rolled Iron and Steel does not show as much animation as it did some months ago, and it is only in Rails that larger orders are in sight. Among these is one lot of 75,000 tons for the Belgian State Railroad and 34,000 tons for Siam, which it is expected will be placed immediately. Probably a rising market would result in this development if the Germans were not beginning to offer Heavy Sections, from 30 kg. per meter and upward, at 94 marks, f.o.b. Antwerp. Our rolling mills sell at Antwerp at 100 marks. Small Sections from 30 kg. and under are sold at £5 4s.

The demand for Beams for our home markets is good since building is developing well.. The price is 130 francs, f.o.b. cars at mill for fair specifications. The sale for export has become a little less ready, and mills are doing well when they realize £4 12s.

In Iron and Steel Bars and Sheets there is a slight slackening which is attributed partly to the rise in freights to certain markets like Japan and to the fact that the plague is again virulent in India. Merchant Bars are still held at £5 4s. for No. 2 and £5 8s. for No. 3, with hopes of an advancing tendency, since the price of Old Material is so high that no profit can be made at these figures. For the home market No. 2 Bars are sold at 137.50 francs and No. 3 142.50 francs. In Steel Bars the competition of Germany is still somewhat felt. The prices are £5 6s., f.o.b., and 140 francs, Belgian stations.

In Plates and Sheets orders are far from being abundant. A number of buyers in our country have as the result of considerable experience with Steel Tubes decided to exclude them in favor of Iron. This example has been followed by some exporters, and there is considerable demand for Iron Skelp, with orders coming more freely. Aside from this there is very little animation. Quotations are as follows:

	Home market.	f.o.b. Antwerp.
Iron Sheets, ⅛ inch and upward	145.00	£5 18 0
Basic Steel Sheets, ⅛ inch and upward	147.50	5 15 0
Open Hearth Steel Shapes, ⅛ inch and upward	157.50	6 7 0
No. 20 Steel	180.00	7 0 0
No. 24 Steel	195.00	8 0 0

The construction shops are well occupied, some fine orders having been divided among them by foreign buyers, notably Italy and China. Belgium will soon place specifications for about 100 locomotives.

The Wire Nail mills are doing very well, the production selling easily both in the home markets and for export at remunerative prices.

News which has created a sensation in the industrial world is the consolidation of three Iron companies, the Ougrée-Marihaye, the Hauts-Fourneaux de la Chiers and the Usines de Vireux-Molhain. The consolidation will have the result that the Ougrée-Marihaye would secure important reserves of Ore, of which the Chiers Company have control, and would secure a supply of Pig Iron, which, until now, they brought from the outside; that the Chiers Company would secure the excellent Coke produced by the Ougrée-Marihaye, and that the Vireux-Molhain would secure the Coal produced at Ougrée-Marihaye and the Pig Iron produced by the Chiers. Thus a consolidation is brought about which supplies their own requirements.

Pittsburgh.

PARK BUILDING, June 10, 1903.—(*By Telegraph.*)

Pig Iron.—While the Pig Iron market remains somewhat quiet, a fair tonnage is changing hands and the tone of the market is fairly firm. The United States Steel Corportation have bought about 10,000 tons more of Bessemer Iron for June and July delivery at $19 at furnace. The market on Bessemer Iron is $19 to $19.25 for ordinary lots for prompt shipment. There is considerable inquiry for Forge and Foundry Iron, and we are advised that prices recently fixed by the Southern furnace owners are being rigidly held. We quote Northern Forge at $19.25 to $19.50, and Northern brands of No. 2 Foundry at $20.25 to $20.50, Pittsburgh. Southern Forge is $18.60 and Southern No. 2 Foundry $19.85, Pittsburgh.

Steel.—There are no inquiries for large lots of Steel, buying being mostly for small lots for early shipments. We quote Bessemer Billets at $29 and Open Hearth at $30, maker's mill. On a round tonnage of Billets for shipment over balance of this year these prices would probably be shaded.

(*By Mail.*)

Matters in the Iron trade seem to be quieting down a good deal, and it is the concensus of opinion that the unrest of labor has much to do with the present unsatisfactory situation. In the Pittsburgh district the greater part of the building trades are idle on account of strikes, the boiler and pattern makers are out, and it is possible an agreement will not be reached with the machinists, whose scale expires on July 1, and they may go out on strike. This cessation of labor has naturally curtailed operations very largely on buildings already under way, and has also had the effect of postponing important building projects that with a peaceful labor market would have been carried through this year. Demand for nearly all kinds of Iron and Steel has been greatly restricted by these strikes, and it seems that labor in its present unfair attitude may bring about a condition of things such as we had prior to 1899, when the present boom in the Iron trade started. It is announced that the Pennsylvania Railroad and other leading roads have postponed indefinitely large improvements contemplated because of the high price of labor and of the hostile attitude of labor organizations in general. It is a pity that such a condition should come up at this time, and it is hoped that the leaders of these labor organizations may see that many of the demands being made are unfair to capital and will be modified. In the Pittsburgh district a number of large buildings partly erected are standing idle, not a man being at work on them. In such a condition there is no incentive for capital to take up new projects, and it will not until conditions improve. The Pig Iron market continues somewhat quiet as far as sales go, probably the largest purchase of the week being a round lot of Bessemer Iron bought by the United States Steel Corporation for early shipment at $19, at furnace. The lower prices made last week by the South-

ern furnaces has not as yet stimulated demand, which continues quiet. The Steel market is very strong and the output of Steel is being taken as fast as turned out by the mills. The Twenty-sixth Street Works of the American Steel & Wire Company are being gotten ready for operation and will start in a few days. Demand for Finished Iron and Steel is fairly large, but is not as heavy by any means as a month or two ago.

Plates.—The quarterly meeting of the Plate Association was held in the Waldorf Astoria, New York City, on Thursday, June 4. All the concerns were represented and a full discussion was had of existing conditions in the Plate industry. It developed that large contracts for Plates from ship and car builders had fallen off considerably in the past month or two, but that current demand from the smaller concerns was keeping up remarkably well and the aggregate new tonnage being booked by the mills is fairly satisfactory. There is no doubt that the strikes in the building trades throughout the country, also the boilermakers' strike in Pittsburgh and other cities, have interfered seriously with new work and has curtailed demand for Plates to considerable extent. As soon as these labor troubles have been adjusted, and it is hoped this will be before long, demand for Plates will no doubt pick up again. No changes were made in prices, but premiums for Plates for prompt shipment have about entirely disappeared. Official prices, which were reaffirmed, are as follows: Tank Plate, ¼-inch thick and up to 100 inches in width, 1.60c., at mill, Pittsburgh; Flange and Boiler Steel, 1.70c.; Marine, Ordinary Fire Box, American Boiler Manufacturers' Association specifications, 1.80c.; Still Bottom Steel, 1.90c.; Locomotive Fire Box, not less than 2.10c., and it ranges in price up to 3c. Plates more than 100 inches wide, 5c. extra per 100 lbs. Plates 3-16 inch in thickness, $2 extra; gauges Nos. 7 and 8, $3 extra; No. 9, $5 extra. These quotations are based on carload lots, with 5c. extra for less than carload lots; terms net cash in 30 days.

Structural Material.—Active work is now going on in the building of the Wabash Depot in Pittsburgh, the Steel construction being erected by the American Bridge Company, in which about 1200 tons of Steel will be used. The elevated tracks and train sheds which are to be erected will increase this tonnage very considerably. There is a steady run of small orders, but the fact remains that the strikes in the various building trades, and also the boiler makers' strike, have caused a very large amount of work to be postponed, and which will hardly come up again before next year. The Structural mills are all very busy, being filled up for several months ahead. Premiums are no longer paid for prompt delivery, and we quote prices as follows: Beams and Channels up to 15-inch, 1.60c.; over 15-inch, 1.70c.; Angles, 3 x 2 up to 6 x 6, 1.60c.; Zees, 1.60c.; Tees, 1.60c.; Steel Bars, 1.60c., half extras, at mill; Universal and Sheared Plates, 1.60c. to 1.70c.

Hoops and Bands.—Tonnage has fallen off a good deal and several of the Hoop mills are getting somewhat slack of work. Prices are without change, but are fairly strong. We quote Cotton Ties, 88c. in 5000-bundle lots and over, and 91c. for less quantities. Steel Hoops are 1.90c. on 250-ton lots and over, and 2c. in less quantities. Bessemer Bands are 1.60c. up to No. 12 gauge, and Open Hearth, 1.70c., extras as per Steel card. These prices are f.o.b. maker's mill.

Muck Bar.—The market continues very dull, there being almost an entire absence of buying. We quote domestic makes of Muck Bar at $34.50, Pittsburgh, but on a firm offer this would be shaded.

Ferromanganese.—No large contracts have been placed for some time, but some of the large consumers who have not covered for last six months will probably come in the market before long and place good sized contracts. We quote 80 per cent. Ferro at $50 in large lots and $52.50 in small lots, delivered.

Rods.—No large contracts for Rods have recently been placed, the leading Wire mills having covered their requirements some time since. We quote Bessemer Rods at $37 and Open Hearth $38 for ordinary carbons. Chain Rods made from Open Hearth stock are held at $40 to $40.50, maker's mill.

Sheets.—Some of the mills report that tonnage in Sheets in the past week has picked up considerably, but there is not yet enough tonnage being placed to keep the immense capacity for making Sheets fully employed. The outlook for the future is regarded as quite favorable, as some of the larger consumers have not covered for third quarter or last six months of the year, and are expected to come in the market before long and place good sized contracts. Prices on Sheets are fairly firm, but without change. We quote Black Sheets as follows: Nos. 22 and 24, Box Annealed, one pass through cold rolls, 2.45c.; No. 26, 2.55c.; No. 27, 2.65c. to 2.75c., and No. 28, 2.75c. to 2.85c. We quote Galvanized Sheets at 75 and 10 off in carload and larger lots for desirable orders.

Tin Plate.—Demand for Tin Plate continues heavy, the favorable weather of the past two or three weeks and the excellent outlook for a large fruit crop creating a demand for Tin Plate, which will keep the mills running to utmost capacity to fill. Inquiries for prompt shipment are coming in by wire, and in most cases the mills are unable to accept these, except for delivery in two or three months or longer. Premiums over official price of the leading interest continue to be paid for shipment within 60 to 90 days. We quote Coke Ternes at $3.90 to $4 a box, f.o.b. mill. The official price of the leading interest is $3.80 per box, f.o.b. Pittsburgh.

Merchant Steel.—There is a moderate amount of inquiry from implement makers, but the actual tonnage placed so far by this trade is disappointingly small. Demand for Tool Steel and for Shafting is only fair. There is no change to note in prices, which are as follows for mill shipment: Tire Steel, 1.80c. to 1.90c.; Open Hearth Steel, ordinary grades, 1.70c. to 1.80c.; Open Hearth Spring, 2.25c. to 2.35c.; Cant Hook Steel, 2.75c. to 3c.; Plow Slabs, Bessemer, 2.50c.; Plow Slabs, Open Hearth, 2.75c. to 2.85c.; Tool Steel, ordinary grades, 6½c. and upward; Cold Rolled Shafting, 42 per cent. off in less than carloads, and 47 per cent. in carloads, delivered in base territory.

Iron and Steel Skelp.—Demand for Skelp is somewhat quiet and prices have gone off to some extent in sympathy with Pig Iron and other products. We quote Grooved Iron and Steel Skelp at 1.90c. and Sheared at 2c., Pittsburgh. It is very probable that if any large tonnage were offering these prices would be shaded.

Pipes and Tubes.—Demand for Pipe continues fairly large, but is probably not as heavy so far this month as in May. However, the leading mills have a great deal of tonnage on their books, being comfortably filled for the next two or three months. Prices are firm and to consumers in carloads are as follows:

Merchant Pipe.

	Steel.		Wrought Iron.	
	Black.	Galv.	Black.	Galv.
	Per cent.	Per cent.	Per cent.	Per cent.
⅛, ¼ and ⅜ inch	68	58	65	55
½ inch	70	60	67	57
¾ to 6 inches	75	65	72	62
7 to 12 inches	69	59	66	56
Plugged and Reamed:				
1 to 4 inches	73	63	70	60
Cut 3 to 6 feet:				
⅛, ¼ and ⅜ inch	63	52	60	49
½ inch	65	54	62	51
¾ to 6 inches	71	60	68	57
7 to 12 inches	65	53	61	50
Cut 6 feet and longer:				
⅛, ¼ and ⅜ inch	64	53	61	50
½ inch	66	55	63	52
¾ to 6 inches	72	61	69	58
7 to 12 inches	66	54	62	51
Extra Strong Plain End:				
⅛ to 8 inches	67	57	63	53
Threads only	66	56	62	52
Threads and Couplings	65	55	61	51
Double Extra Strong Plain End:				
½ to 8 inches	59	49	55	45
Threads only	58	48	54	44
Threads and Couplings	57	47	53	43

NOTE.—Orders for less than carload will be charged at 12½ per cent. advance. Extra and Double Extra Strong Cut Lengths, lower random discounts by 10 per cent. net for 6 feet and longer, and 15 per cent. net for 3 to 6 feet.

We may note, however, that some of the outside mills quote slightly lower prices on Iron Pipe than are given above.

Coke.—Demand for Coke continues large, but output is heavier than ever before in the history of the trade, with the result that more or less surplus Coke is being offered in the open market and at low prices. It is the general opinion that the price of genuine Connellsville Furnace Coke on contracts for shipment over last three months will not be above $3 at oven and may be slightly under that figure. Seventy-two-hour Foundry Coke on contracts for shipment over last half of the year is quoted at $4 and up to $4.50 a ton at oven. Output of Coke is phenomenally heavy, being over 305,000 tons last week.

The offices of the United Engineering & Foundry Company will be removed on July 1 from Bank of Commerce Building to twenty-third floor Farmers' Bank Building, Pittsburgh. The entire twenty-third floor will be occupied.

Creditors of the H. C. Fish Company, lathe builders, Worcester, Mass., filed a creditors' petition in bankruptcy June 9, liabilities $15,000, assets about the same. Petitioners are local creditors. H. C. Fish, president of the company, filed a voluntary petition in bankruptcy, liabilities about $60,000, including about $22,000 in indorsements of the H. C. Fish Company's notes. It is claimed that the company will pay 100 cents on a dollar and that business will be continued.

Industrial Affairs in Scotland.

GLASGOW, May 28, 1903.—Now that all the immediate danger of a strike in the shipbuilding trade is at an end there is more flatness in the iron trade, and especially with regard to pig iron. The private advices which reach us from your side do not all coincide with the published market reports, but your enormous output is impressive and irresistibly conveys the impression that America cannot for long want any British iron, but will probably soon be offering to send iron here. There has been a complete break in warrants, due to realization by bulls and assaults by bears. There is a bull feeling still existing in London which has led to some buying in the ring here, but the feeling in Glasgow is rather bearish, as there seems nothing likely to take the place of the American demand and there is no improvement in the prospects of shipbuilding. The little recovery in warrants to which I referred a fortnight ago was followed by a further decline, but the transactions are now of small daily dimensions. This week New York cables report a 25-cent decline in Northern pig iron with you, and prices here would be lower than they are but for the fact that smelters are having some labor troubles with their men just now; so much so that ten furnaces were actually damped down for a day or two, and there are reports of several more being intended to be stopped if the trouble continues. This is a significant feature in the situation, for Scotch smelters have no stocks and require all their output to meet their trade engagements. Some of the bears have been getting fidgety, and certainly the position is awkward for an oversold account. Prices of warrants as I write are 52 shillings 9 pence for Scotch, 45 shillings 9 pence for Cleveland and 57 shillings 9 pence for Cumberland. The Glasgow warrant stock has been further reduced and now stands at only 15,640 tons. The shipments of Scotch iron so far are 20,000 tons ahead of the corresponding portion of last year. The shipments from Cleveland are about 75,000 tons ahead of last year. A few days ago the steamer "Massapequa" was chartered to load pig iron at Middlesbrough for Philadelphia at 6 shillings 6 pence freight and the steamer "Indrani" to load at Birkenhead for Baltimore at 7 shillings freight, against the recent sales of hematite already reported.

For hematite iron there is a considerable demand from steel makers, and it is for this quality that all the inquiries now are from your side. The output in Scotland has been reduced by the damping down of furnaces and the price in Scotland is 62 shillings, delivered to steel works. Middlesbrough hematite (of which there are only 900 tons in public stores) is 58 shillings 6 pence, delivered to steel works in Cleveland. Cumberland hematite is held at 59 shillings 6 pence for mixed numbers, f.o.b., and several cargoes of it are being brought round to Glasgow just now. The shipments of all iron and steel from Cumberland ports decreased last week by 9425 tons in comparison with the corresponding week of last year; but for the year to date the shipments of pig iron thence have aggregated 153,043 tons, as compared with 152,930 tons, an increase of 110 tons. There has been a reduction of make in Cleveland also, owing to the change of several furnaces from one quality to another and to the damping out of one or two.

There are now 82 furnaces in blast in Scotland, as compared with 83 last week and 85 in the corresponding week of last year. Of these 82 31 are on ordinary iron, 45 on hematite and six on basic. In Cleveland there are 82 in blast, as compared with 82 last week and with 78 in the corresponding week of last year. In Cumberland there are 33 in blast, being the same as last week and comparing with 36 in the corresponding week of last year.

While steel makers here are pretty well employed on current contracts, they are not booking much new business. Steel ship plates are now offered here at £5 17s. 6d., less 5 per cent., delivered to the shipbuilding yards on the Clyde, though in the North of England the quotation is still £6, less 2½ per cent. Middlesbrough prices are: Steel angles, £5 12s. 6d.; iron ship plates, £6 15s.; iron angles, £6 7s. 6d.; common bars, £6 10s., all less 2½ per cent., and steel rails, £5 10s., net. Cleveland No. 1, G. M. B., is 49 shillings; No. 3, 46 shillings 6 pence; No. 4 foundry 46 shillings 3 pence, and No. 4 forge, 45 shillings 3 pence. In Glasgow quotations for bars, angles and shapes are somewhat restrained, in consequence of the delay in announcing the completion of the malleable iron combine. As it was understood that all the financial details had been arranged and even the directors of the new company selected, the delay is regarded in the trade as suggestive of a hitch which may result in free selling. I have reason to believe, however, that the deal is complete and only awaits adjustment of one or two personal details. A reduction of 2 shillings 6 pence per ton has just been made in sectional bars.

The trouble in the engineering branch of the shipbuilding trade, referred to in my last, has now been arranged—at all events for a period. On the Clyde men are undertaking to return to work at the reduced rates pending discussion; a further conference was held between their officials and the Employers' Federation. At this conference the employers, while declining to withdraw or abate the reduction, which corresponds with what all the other trade unions had accepted, agreed to limit the period of the new scale to three months instead of to six months, which is the usual term of working agreements in the trade. By this concession the engineers (machinists) will be able to raise the wage question again on August 1 if they wish, though there is not much probability of improvement in shipbuilding in the interim, as June and July are usually slack months in the trade. The employers were induced to make this concession because their agreements with the other trade unions in the shipyards will expire at that time, and in fixing wages anew it is desired to have all the trade unions in line, bound to each other as well as to the employers. The machinists have annoyed the other trade unions quite as much as the federated employers by their recent insubordination, and in trade union circles generally the language with which the rebellion against the Executive Council of the A. S. E. is denounced is both "frequent and free." While the rebels have at length accepted the advice of their officials, they have not done so without passing resolutions of disapproval. On their part the Executive Council of the A. S. E. have issued a statement of the case to all their members and to the public, and amply justify the position they assumed. It seems to me that the action of the central authority of the Amalgamated Society of Engineers during the recent crisis has been so steadfast and straightforward, and so much in contrast with that of the officials of some of the trade unions on your side, that it is well worthy the careful study of American employers.

While we have from Bilbao assurances that the ore supply in the North of Spain is not so near exhaustion as has been supposed, the situation is improving as regards the domestic supply of ore. Evidences are presented of a gradual exhaustion of the hematite resources of the Furness district, and explorations have been going on for some time with the view of discovering new deposits. The last important discovery was at the Ronhead mines and the proving of this new find has led to very satisfactory results. The deposit is of vast extent and though the company have not yet fully proved the area it covers, sufficient is known to make this the most important find of ore in Furness during the last 20 years. The quality of the ore is said to be of the best. With a large deposit of rich iron ore at Ronhead, south of the Duddon estuary, with a still larger and richer deposit at Hodbarrow, north of the Duddon estuary, and with improved workings of the great mine at Lindal, the prospects of the hematite iron ore trade of Furness are brighter and better than they have been for many years past.

A correspondent at Stockholm, in Sweden, advises that the railway connecting the Gulf of Bothnia with the Atlantic, from Lulea to Narvik, close to the Russian frontier, is to be opened throughout its whole length next summer. The railway is built by the Swedish and Norwegian Governments to facilitate the exportation via Narvik of the immense quantities of iron ore found at Kirunavaara and Gellivara. Through bad management and overspeculation a crisis has for some time been im-

pending with regard to these iron ore fields. Last year the Government proposed to secure them for the State, with a view to prevent their passing into foreign hands. This proposal, however, was rejected by the Riksdag. Another attempt to save them for Swedish capital encountered the same fate. The Grangesburg Society, which was originally formed by the initiative of Sir Ernest Cassel and now includes a great many of the iron works of Central Sweden among its shareholders, offered to buy the iron fields on certain conditions. Among these the essential stipulation was that the State should give the society a loan of 20,000,000 crowns, which the Riksdag would not consent to. As it seems of vital importance to the iron industry of Sweden that the Kirunavaara and Gellivara mines should be controlled by Swedish capital, a way will almost certainly be found to prevent their passing into Russian or German hands.

No sooner have the difficulties in the shipbuilding trade in Scotland and on the northeast coast of England been adjusted than a similar case arises in the Northwest of England—viz., in Barrow-in-Furness—where are the extensive works of the Vickers, Sons & Maxim Company and who work in alliance with William Beardmore & Co., Limited, Glasgow. The Barrow employers wish to make an equivalent reduction in wages to that adopted on the Clyde, though they deferred action longer. The men objected and asked for a local conference. At the local conference no agreement was arrived at, and reference has been made to a conference of the Executive Councils of the Employers' Federation and of the Allied Trade Unions. The decision will doubtless be the same as in the other cases, but in the meantime the Barrow men are leaving the matter in the hands of their officials and are continuing at work. Then in Scotland another labor question has followed upon that in shipbuilding. The associated Scotch coal owners have intimated an intention to reduce wages 3 pence per day to 5 shillings 6 pence per day, owing to the depressed condition of the coal trade and the low prices current. They cannot go below 5 shillings 6 pence per day in the meantime, because that is the minimum limit within the jurisdiction of the Joint Board of Conciliation, which was appointed last year and whose term of office extends till August next. To this board the application of the coal masters has been referred, and of course the representatives of the miners on the board will not agree that the reduction is necessary. It will be necessary, therefore, to call in a neutral chairman, who in terms of the constitution of the board acts as arbiter when the two sides cannot agree. He may order an inspection of the colliery books, but what with adjourned meetings and other delays it is not probable that a settlement will be effected before the July holiday time, when our miners usually take about a fortnight's ease above ground. But whether or not the minimum wage is reached before the present Board of Conciliation terminates, it is extremely improbable that the coal masters will agree to the renewal of the board unless the minimum is reduced. Thus we have the prospect of a heated discussion in the coal trade in the autumn. The institution of a minimum wage at all is an economic mistake, because it must operate against the advantage of the men in bad times. If a coal master, owing to the situation of his seams, cannot produce coal at a profit on the wages decreed, and if he cannot get these wages reduced to suit the circumstances of bad trade, he must close his colliery and throw his men out of employment altogether. This has happened before now in the Midlands, where the fallacy of the minimum wage was first sent up for worship; but nothing seems able to convince the miners and their leaders that the coal owners do not make the price of coal.

The shipbuilding returns for the month are just being made up as I write. They show that while the launches from Scotch shipyards in April aggregate about 45,000 tons (including the new battle ship "Commonwealth" built by the Fairfield Company), the new contracts booked during the month barely reach 20,000 tons. B. T.

The General Incandescent Arc Light Company have moved their Chicago office to 1218, 1219 Marquette Building.

The Color Test in High Carbon Steels.

BY GEORGE AUCHY, PHILADELPHIA, PA.

Although the color method of determining carbon in steel is so widely used and trusted, its accuracy has nevertheless often been called in question. Thus, for instance, Parker says (*Chem. News*, 42-88), that it is "liable to great variations;" Galbraith (J. I. S. I., '81, 234) declares that it "should be abandoned;" Tucker (J. I. S. I., '96, 1, 137) states that its "inaccuracy is well recognized;" Hadfield (J. I. S. I., '96, 2, 187) says, "It had long been a matter of knowledge in the Sheffield steel trade that the color test was apt to give misleading results;" Metcalf, in his book "Steel," characterizes it as "the wildest guesswork in the best hands;" Campbell, in his book "The Manufacture and Properties of Iron and Steel," and also elsewhere, repeatedly and emphatically expresses distrust of the method. The metallurgists quoted are eminent ones, and their opinions are worthy of consideration and respect. What have chemists to say in reply? In view of the meagerness of the literature on this subject the writer may perhaps be excused for thinking a recountal of his experience, extending over a period of about nine years, may be of interest.

For years the method was used by him with a confidence not the result of mere fancy, but gained by many good results repeatedly obtained. No thorough and systematic testing of the method had, however, been attempted. But when finally such a testing was made it was found, to the writer's surprise and dismay, that although usually results were fairly good, yet poor results frequently occurred. It was seen that the same drillings did not always dissolve to the same shade. It was laboriously sought to get over this difficulty by weighing out duplicates of the samples and triplicates of the standard. Then it occurred to mind that possibly the reason for the differing shades lay in the fact that 0.2 gram drillings was an amount insufficient to insure a fair average sample of the drillings in all cases. To test this point the following determinations were made:

	0.2 gr. drillings. Carbon, per cent.			1 gr. drillings, aliquoted. Carbon, per cent.		
No.						
3638	0.96	1.055	1.02	0.98	0.98	0.995
3625	1.28	1.18	1.18	1.20	1.18	1.17
3488	0.74	0.87	0.84	0.865	0.86	0.84

It is seen that results varied widely when only 0.2 gram drillings were used and did not when 1 gram was used. Accordingly, instead of duplicates, the plan was adopted of weighing out 1 gram into test tubes of about 41 c. cm. capacity, provided with a file mark at 25 c. cm. Twenty c. cm. of acid was used for solution, the liquid after the usual heating diluted when cold to the mark, mixed by placing the thumb over the tube and inverting a number of times, and 5 c. cm. withdrawn by a pipette for comparison in the carbon tubes.

But the renewed confidence with which the method was used ultimately received a very severe shock. It was found that although long rows of good results could be obtained, occasionally a very bad one (0.08 to 0.10 or more) would occur. Duplicates were then again resorted to, retaining the 1-gram method. But finally an experience was had which was nothing less than terrifying, and which seemed to make a total abandonment of the method imperatively necessary. A steel tested in the regular run of work gave 1.05 and 1.06 per cent. carbon by duplicate analysis as described, and was set aside for file steel. But in chipping it was noticed by the workman that it was soft for file steel. The original drillings tested again gave 0.78 per cent. carbon by color and 0.775 by combustion. Evidently duplicate analysis gives no assurance of accuracy. It is but fair to say, however, that no such extreme error as this ever before occurred to our knowledge, 0.08 per cent. to 0.10 to 0.12 per cent. seeming to be the extreme of error.

But one thing remained to be tried: In dissolving the 1 gram of drillings in the test tube it was found necessary to add the acid gradually at first to prevent frothing over (although, of course, the test tube was placed in cold water, as is customary). The idea occurred that perhaps, to insure accuracy, it was necessary to have the

acid in excess from the very start. This idea did not seem to promise much, however. It was thought more likely that the variation in the results was caused by loss of carbon in the form of hydrocarbon gases, and in that case it was not seen how any remedy could be applied. But in the forlorn hope that the addition of the acid all at once might prove the remedy, the acid was made ice cold before using by immersing a beakerful of it in a larger beaker of ice and water for some time, and instead of having the test tube containing the drillings to stand in the bath of cold water when the acid was added, it was moved around rapidly in a large beaker of ice water for 30 or 50 seconds after the addition of the acid, then placed in the bath of cold water (not ice cold; if the violent action of acid is prevented at the very start it does not occur at all) and the contents of the bath brought to a boil and the process finished as usual. All that this plan of dissolving was expected to accomplish was to prevent the frothing over of the acid when added all at once. It was not supposed that all violent action would be prevented. But much to the writer's gratification such proved to be the case. Not only was frothing over prevented, but all violent action whatever. This was thought to be highly important, as it would seem to be a remedy, whichever of the two causes of error above mentioned might be the true one. This manner of dissolving permitted of the acid being added all at once and at the same time prevented loss of hydrocarbon, or at least insured a uniform loss of hydrocarbon in all probability. It was at once believed that the end of the difficulty with the color method had been reached, a belief which subsequent testing justified and confirmed. Duplicate results no longer disagreed, and an extended experience with the method brought the conviction that it was as accurate as the combustion method—as accurate as to method, that is to say, which is not to say as accurate as to results. For still the uncertainty remained that all steels of the same kind might not contain approximately the same proportion of hardening to carbide carbon, and as the former gives no color in the color test any great variations in this proportion would be fatal to good results, no matter how accurate and free from sources of error the color method might be a method.

This point, therefore, remained to be tested: Do steels of the same kind always contain approximately the same proportion of hardening to carbide carbon? And if not, what is the greatest error in the color test to be expected from this cause, and how frequent its occurrence? On the face of it, it would seem highly improbable that in the case of ingot steels—where the color test finds its greatest use—and still less probable in the case of billets and blooms, that there should be any such great variations. The following 50 tests were made in open hearth high carbon steels. The standard used was one made up of drillings from 20 different heats mixed together:

Heat No.	Color. Per ct.	Combustion. Per ct.	Heat No.	Color. Per ct.	Combustion. Per ct.
887	0.33	0.35		{0.82}	0.895
888	0.73	0.69	890	{0.84 {0.83	0.89 {0.895
889	1.03	0.995	841	0.725	0.74
893	0.90	0.90	892	0.36	0.365
894	1.01	0.985	901	0.865	0.87
895	0.88	0.925	902	0.85	0.865
897	1.00	0.995	903	0.96	0.96
	{0.865}	0.90}	904	0.75	0.745
898	{0.88 {0.87	0.91 {0.905	905	0.815	0.83
899	0.99	0.98	906	0.865	0.845
900	0.895	0.89	907	0.94	0.91
908	0.89	0.89	915	0.725	0.73
909	0.83	0.805	916	0.80	0.835
910	1.23	1.21		{0.815}	0.86}
911	0.97	1.00	917	{0.855 {0.835	0.86 {0.86
912	1.075	1.055	918	1.055	1.04
913	1.225	1.185	919	0.77	0.795
	{.106}	1.11}	920	0.955	0.995
914	{1.07 {1.065	1.095 {1.105	921	0.99	1.02
922	0.815	0.85		{0.87}	0.86}
923	1.03	1.005	929	{0.865 {0.87	0.88 {0.87
924	0.85	0.87	930	0.81	0.825
925	1.00	1.04	931	1.09	1.115
	{0.73}	0.79}	932	1.23	1.26
926	{0.72 {0.725	0.78 {0.785	933	1.015	0.99
927	0.86	0.885	934	1.12	1.11
928	0.92	0.89	935	0.93	0.965
936	0.98	0.955	937	1.16	1.125

Assuming that the color method as here carried out accurately determines the carbide carbon (and from the unfailing agreement of duplicate tests it is believed that it is fair so to do), then the differences in results by color and by combustion are due to differences in proportion of hardening to cement carbon in standard and sample. Considering a result within 0.03 per cent. of the truth to be a good one for practical purposes, and one within 0.04 per cent. to be permissible if occasional, then of the 50 tests made it is seen that 48 results are good ones and two are not. In these two the error is 0.065 and 0.06, and this occurring only twice in 50 tests may well be put up with in view of the great ease and convenience of the color method as compared with the combustion method.

To sum up: The color method, as usually carried out, is unreliable and gives sometimes wrong results, but may be made to give reasonably accurate results by the observance of certain precautions. The sources of error in the ordinary method are: (1) Inherent errors in the method itself; (2) differences in the proportion of hardening to cement carbon in steels of the same kind. Errors of the first class may be avoided by the use of the following precautions:

1. One gram drillings must be taken for the test, as before described.
2. The acid used for solution must be very accurately measured out.
3. The acid must be ice cold, must be added all at once, and the test tube immediately after addition of the acid moved around rapidly and vigorously in a large beaker of ice water for a minute before being placed in the water bath containing cold (ordinarily cold, not ice cold) water.

The observance of these precautions gives a result that the writer is inclined to think would be as accurate as one by combustion were it not for the second source of error above mentioned—the error from differences in hardening carbon between standard and sample. But this error is one that in the nature of things could hardly be expected to be a great one, especially in crucible steels, provided the well-known and universally observed rule be adhered to of having for a standard steel of exactly the same kind as samples to be tested; and from the 50 tests made by the writer on open hearth high carbon steel it would seem that the error from this cause never exceeded 0.065 per cent., and may not be expected to occur much oftener than twice in 50 tests.

The combustions of the above table were made with the use of a very slow rate of gas flow through the apparatus—one bubble (counting in the first or purifying potash bulb) every three seconds for 1¼ hours, followed by ¼ hour of a one bubble per second rate.

Metal Market.

NEW YORK, June 10, 1903.

Pig Tin.—The market has declined since our last report, both spot and futures reaching a lower level of prices. A very quiet condition prevails in the market as regards transactions, buyers being slow in their purchasing. The market at the close presented a weak appearance, spot Tin being quoted at 28c. and 28¼c., with 27⅞c. to 28⅛c. for June delivery. Future deliveries were entirely nominal. The London market also suffered a sharp decline, prices at the close being quoted at £126 5s. for spot and £124 for future.

Copper.—The Copper market still remains unsettled and weak, with prices ruling lower than a week ago. A reduction of ¼c. per lb. in the official quotation on Lake and Electrolytic Copper, and of ½c. on Casting Copper was announced on Monday. This reduction, however, caused no surprise to the trade, such an announcement having been generally expected. So far but little increase in the volume of transactions is recorded in consequence of the lower level of prices. The market, in short, remains very quiet. Producers' official quotations on Lake and Electrolytic are 14½c. to 14¾c., and on Casting Copper, 14c. The London market declined heavily to £56 5s. for spot and £55 10s. for futures. Best Selected declined to £62.

Pig Lead.—There has been no change in the situation of the metal here, the market being quiet and somewhat easy. Quotations remain at 4.37½c. for Desilverized in carload lots, f.o.b. New York. London has declined again to £11 7s. 6d.

Spelter.—While the demand for Spelter is not urgent, spot supplies are very scarce, owing to the floods in Missouri, and the market presents a very strong appearance; 6c. is quoted nominal for spot, New York. St. Louis quotations are 5.60c. London prices are unchanged at £20 15s.

Antimony.—There has been no change in this metal. Cookson's is quoted at 7½c., Hallett's at 7c., and other brands at 6⅝c.

Nickel—Is quoted at 40c. to 45c. for large quantities and 50c. to 60c. in small lots.

Quicksilver.—A moderate business is reported, the market ruling at $47.50 for flasks of 76½ lbs.

Tin Plate.—No change worthy of note has occurred in this market, which remains firm. Shipments on former contracts are heavy and the mills are generally active. Current transactions are of moderate proportions. Prices remain firm. The American Tin Plate Company's quotation continues at $3.80 per box of 14 x 20, 100 pounds Cokes, f.o.b. mill, which is equivalent to $3.99, New York.

Boston Machinery Market.

BOSTON, MASS., June 8, 1903.

The summer quiet has set in among the machinery dealers. Business is not so brisk, as a rule, although the dealers are not complaining. They suspect that business would be a little better were it not for the unsettled condition of labor through the country, but at the same time they realize that New England is not very much afflicted with this trouble, and that their own customers are affected by strikes only as it comes to them indirectly.

May was not so good a month in the volume of business as was April, yet it was better than the same month last year, and bore not the slightest resemblance to the miserable month of February, when the machine tool business struck low water mark.

There is no big business in sight in this section of the country. The orders continue to be for small lots, a tool here and a tool there being the rule, with an occasional bunch of machines to liven things up. But dealers do not complain when orders are small, providing there are enough of them, and there have been enough the last few weeks to pay a good deal more than rent. The dealers have their eyes on the Perkins Machine Company, who are to build a large shop, and there are several other good ones in the air, with no definite information yet available. The Prentiss Tool & Supply Company, Hill, Clarke & Co., and Manning, Maxwell & Moore pretty nearly agree in their statements of recent business conditions.

There seems to be little doubt that manufacturing business in New England is suffering fully as much from suspicion of the immediate future as from direct results of the condition of labor as shown in strikes of magnitude in various parts of the country. In New England many lines of manufacture are directly affected by strikes in other sections of the country, but as a rule the direct loss is comparatively insignificant. But conversations with manufacturers all over the New England States bring out in practically every instance a sense of insecurity, more or less pronounced. The reasons are not tangible. The manufacturers say so. They inquire with much earnestness for information of what others in the iron and steel trades are talking. They mention the general subject of labor. They express a disposition to "go slow" in making enlargements. Not a few instances are found where a manufacturer says, "we need more room and more equipment. We cannot keep up with orders. We could use a plant double our present size. But what would be of advantage now might soon be a disadvantage, an additional load to carry through times when prosperity is lacking." The grand total of this disposition to look out for squalls is an important factor in the business situation. Where every one is cautious every business is adversely affected. Caution has its advantages if it be true that hard times are imminent, because manufacturers will not be caught napping, as they occasionally have been in the past. But, on the other hand, a general feeling of apprehension, if it has no good reason back of it, is apt to be the one additional hair which breaks the back of prosperity. If every manufacturer to-day felt optimistic of the future the future would possess much less danger of business depression. And as one strike after another is settled and the spirit of unrest on the part of labor is subdued, the spirit of caution among manufacturers will doubtless subside, and their orders one with another will increase. This is a condition which Boston machinery men point out and it is generally acknowledged to exist.

There is exceptionally good demand in New England for small pumping and power outfits. The farmers are buying. Windmills are in good demand. Agricultural implements are going well. The pipe and valve people are well contented with present conditions. The dealers in gasoline engines and steam motors are finding fault because their number has been augmented by a good many newcomers, so that while more such engines are being sold, the profits are more widely distributed. With the dealers in power engines of larger sizes and in large boilers the demand is perhaps not quite so good as it has been.

The demand for electric motors and generators and electric appliances generally is excellent. Various plans to develop water power for electrical transmission to manufacturing centers and for street railway and electric lighting purposes are being considered. One such is in northwestern Massachusetts, where a syndicate of Boston and Providence men are said to be planning the development of water power in Readsboro, Vt., in the Deerfield River basin. According to the story a fall of 800 feet can be secured by leading water from a pond to a point on a mountain. Details are missing, however. The purpose of the development will be to supply North Adams with power.

The time is approaching when the Metropolitan Water Board of Massachusetts will be in the market for an electrical equipment and turbine water wheels to develop the power from the great reservoir on the South Branch of the Nashua River, at Clinton, which will be the largest reservoir in the world. The daily flow of water will be at least 100,000,000 gallons a day, and as the dam will be 140 feet high, an enormous head will be obtained. This power will be developed and sold to the highest bidder. It is expected that a street railway will get it, because, running practically 24 hours a day, a street railway corporation can afford to bid higher than any manufacturing establishment in the vicinity.

The Perkins Machine Company of South Boston are to build a large modern plant for the manufacture of press punches. Their foundry was destroyed by fire a fortnight ago, and it was decided that instead of rebuilding on rented property, they would build for themselves. An option has been secured on 120,000 square feet of land on the water front, which has also the advantage of being adjacent to the tracks of the New York, New Haven & Hartford Railroad. The plan is to erect a main building 130 x 600 feet, to contain the machine shop and foundry. It will be one-story, with high monitor roof and probably without galleries. The material will be steel and terra cotta, to render the structure absolutely fire proof. The foundry end of the building will be at the dock, that materials may be dumped direct at the point of consumption. A 30-ton traveling crane is planned and a spur track will enter the building. Other buildings will be pattern shop, a pattern storage building, a warehouse for finished machinery and a power house, all of fire proof construction. It is proposed to begin building operations within a month. The fire has not materially hindered the company's business. The old foundry of the B. F. Sturtevant Company at Jamaica, Plain, recently vacated for the new Sturtevant foundry at Hyde Park, has been rented to fill the gap, and arrangements have been made with other foundries to take care of the lighter work. The business has just been incorporated under Massachusetts laws with a capital stock of $100,000. The officers are: President, C. A. Perkins; secretary, Fred. Perkins; treasurer, Bertram D. Perkins, and directors, these officers and Col. Albert A. Pope, who is a large stockholder.

The Fore River Ship & Engine Company of Quincy, Mass., are to build an extension to their forge shop, 100 feet long and 108 feet wide, the width of the present shop. The new building will be equipped with a very heavy traveling crane and every other convenience in the way of cranes, &c., to secure economy of handling. A brass foundry, 72 x 75 feet, is now building. The company have just built a branch railroad 2 miles long from the South Shore branch of the New York, New Haven & Hartford Railroad, which went into operation last week. New docks will be built for the landing of coal and other supplies. The Fore River Company have received the contract for a 4000-ton iron side wheel steamer for the Fall River line, the new vessel, which has not yet been named, to be a duplicate of the "Puritan" of the same line. Another contract is for a fast freighter for the same line, of 3000 tons displacement and with twin screws. The passenger boat has been framed out and is receiving the first of its plates this week. A 5000-ton six-masted iron schooner is for the Crowley Company, the vessel being much like the monster seven-master "Thomas M. Lawson," excepting somewhat shorter and of less displacement. The Fore River Company regret the impression which has gone abroad through newspapers that the "Lawson" is a failure because she ran aground on shoals. While true that her draft is so great under her full burden of 8500 tons that she can enter few harbors, on the other hand few harbors are not accessible with 7000 tons of coal aboard. She is doing a thriving business, having already earned 30 per cent. on her cost.

Another order of the Fore River Company is for four steel car floats for the New York, New Haven & Hartford, for use in New York harbor. They will be 320 x 46 feet and will carry 23 of the largest cars. The iron car float is rapidly replacing the wooden float for various good reasons. It has greater buoyancy, will tow with about half the power, is much easier to handle, and is safer because of its watertight compartments, there being 18 of them. The greater cheapness of operation will pay the difference between the initial cost and that of a wooden float in two years, it is claimed. The Fore River Company built two such floats for the Consolidated last year, and the claims are based on actual test. The protected cruiser "Des Moines," building at the Fore River plant, will be ready for her trial trip very soon, and the battle ships "Rhode Island" and "New Jersey" are 40 per cent. completed.

The General Electric Company are about to erect a large machine shop at the Lynn works. The new building will be 150 x 630 feet on the ground and two stories in hight. The company will be in the market for a large amount of machinery a little later on. The purpose of the building is given out as general manufacturing, the exact purpose not having been determined. But it is benerally believed in the trade that a large part of the building will be given over to the manufacture of the Curtis turbine engine. The larger engines of this type are being built at the Schenectady works of the General Electric Company and the smaller sizes at Lynn. The company are building other less important additions this season. Building permits have been taken out for a one-story brick addition to Factory 2, which will be 120 x 395 feet; a one-story wooden building, 68 x 150 feet, to be

devoted to cleaning castings, and a brick building one story high, 38 x 160 feet, for their treating department.

The Old Colony Division of the Massachusetts Electric Companies are putting in a number of the Curtis steam turbines, and one of the engines has been used for several days at the new Newport power station. This engine, which has 2000-kw. capacity, was tested for half a day with a load on with exceptional results. Under the contract with the General Electric Company the Massachusetts Electric Companies, who operate a great railway system in Eastern Massachusetts, agreed not to give out tests until the builders of the turbines were ready to make them public. But it is known that this engine showed not far from 2 pounds of coal per kilowatt hour, which is considerably better than any electric plant in Eastern Massachusetts has done. It is said that this is the first time a steam turbine has been given a street railway load, which is, of course, exceedingly variable, and the results of these tests are being looked for among street railway men everywhere.

The Old Colony Division are installing other Curtis turbines. A new plant is building at Quincy Point, in which will be installed four 2000-kw. engines and eight 750 horsepower Aultman-Taylor boilers. The power station will be large enough to receive additional engines and boilers. The same company are to build a new power station at Fall River and will install three 2000-kw. turbines and six 750 horsepower boilers. This station will also be large enough to permit of increased power when the demand of the system shall require it.

The Lumsden & Van Stone Company of Boston have the contract for the piping and fittings of the Quincy plant, and did the work for the Newport plant.

The methods of some French manufacturers of self hardening tool steels have been discussed on every side in Boston machinery circles, and the discussion has served to bring out the fact that the American manufacturers of this important product have distanced their competitors across the water in the matter of quality. This steel is becoming more and more a very important factor in the modern machine shop. It has passed the experimental stage for lathe, planer, boring mill and other similar tools, and the manufacturers of such tools as gear cutters, twist drills, taps and reamers are making every effort to overcome the one difficulty in the way of complete success in the use of the self hardening steels. It has been found difficult to temper tools after they have been worked. The steel must, of course, be annealed before it can be worked, and in the tempering which must be given the finished tool uneven results have been obtained. It has been something of a gamble whether the tempering process was a success. But the manufacturers are learning. The makers of the steel have been consulted and have given their customers the advantage of their experience until now the percentage of failures to procure correct and even hardening is becoming smaller and smaller. In almost every modern shop in New England the shafting is running very much faster than it ever could have done without the assistance of the self hardening tool steel, and the end is not yet. Consequently the demand for the steel is growing steadily, and at the same time the American steel concerns are distancing their competitors in France and other European countries.

The American Tube Works will not build at present on their new property at Braintree. The company own some 45 acres of land in that town on the water front not far from the Fore River Works, and it has been supposed that their plant at Somerville would be abandoned. On the contrary, buildings started last year at Somerville are now being finished and, while the matter is not yet settled, it is likely that when the Braintree land is utilized the Somerville plant will be retained.

The George Lawley & Son Corporation have acquired several acres of lsand adjacent to their works at South Boston. This land is occupied by the buildings of the old House of Correction, which include shops that may be made available for manufacturing purposes of the company. Later on it is probable that a new machine shop will be erected on the premises, but the officers of the company state that the report in machinery circles that the shop will be built this year is not correct.

O. S. Walker & Co., manufacturers of special machinery at Worcester, Mass., are to remove to a larger shop on Union street, not far from their present location.

A new corporation known as the Cutter Nail Company have taken the factory recently occupied by the Woodward Mfg. Company, manufacturers of shoe machinery, at Ashland, Mass., and will manufacture horse nails by a new process, by which it is claimed they can be made at a greatly reduced cost. The factory will be equipped for a production of 20 tons a day, and it is given out that the company expect to be producing 1 ton a day by July 1. They are a Maine corporation with these officers: President, Solomon M. Cutter of Lynn, Mass.; secretary and treasurer, Herbert W. Pratt of Swampscott, Mass.; directors, Mr. Cutter, James N. Smith, James P. Phelan and T. R. Grow, all of Lynn. Mr. Cutter, the patentee of the new process, is the pastor of the Chestnut Street Congregational Church of Lynn and is said to be a nail machine expert. The machinery and stock of the Woodward Mfg. Company are to be sold by a trustee.

The Denison Mfg. Company are building a considerable addition to their factory at Ashland, Mass.

The Francis Reed Company of Worcester, Mass., are occupying their new shop.

Augustus H. Skillen has been appointed receiver of the Mossberg & Granville Mfg. Company of Providence, R. I., by Judge Holt of the United States District Court of the Southern District of New York. It is generally understood here that there is little doubt that the business will be continued as soon as the bankruptcy proceedings are ended, but no plans to that effect are yet matured.

The Lumsden & Van Stone Company, contracting and general engineers, have built a foundry and machine shop at South Boston. The foundry is 65 x 200 feet and the machine shop 60 x 180 feet.

The Wright Wire Company are planning to add to their wire drawing mill at Palmer, Mass., that they may manufacture their own special wire for wire ropes and cables, lines recently added to their business. The wire rope department is now marketing these new products.

The Reed & Prince Mfg. Company of Worcester, Mass., are about to move into their large new plant. The present shops are owned by the Crompton & Knowles Loom Works, who are planning to make improvements to the property in the near future and use it as an addition to their Grand street works. However, it is not certain that the addition will be made this year, the officers of the company declining at present to state their plans.

The monthly meeting of the New England Foundrymen's Association will be at the Hotel Essex, Boston, Wednesday, June 10. It is expected that a representative of the Account, Audit & Assurance Company of New York will address the meeting on "Manufacturing Costs."

The Slater Engine Company of Warren, Mass., who made an assignment for the benefit of their creditors May 25, filed a petition in bankruptcy at Boston, Saturday. The schedule shows liabilities of about $170,200, of which $58,400 is secured and assets of $31,800. It is planned to reorganize the business as soon as bankruptcy proceedings are ended and form a corporation for the conduct of the business. At present the Slater Engine Company are a copartnership between Frank Slater and George M. Faulkner.

A Walking Delegate Accused of Bribery.

The arrest of Samuel J. Parks, a well-known walking delegate of the Housesmiths', Bridgemen's and Structural Iron Workers' Union in New York City, on a charge of extortion, founded on two affidavits, one by President Neils Poulsen of the Hecla Iron Works of Brooklyn, and the other by R. A. McCord, a son of William H. McCord of the American Bridge Company, is the culmination of the labor troubles which have tied up operations in the Hecla Iron Works. Mr. Poulsen declares that in April last year, while a strike was in progress at the Hecla Iron Works, Parks came to him and told him that unless he paid him a sum of money he would cause a strike in his establishment; but that if, on the other hand, the money was paid the strike would be called off. Mr. Poulsen says that, in the belief that Parks could make good his threat, he authorized William H. McCord of the American Bridge Company to pay $2000 to Parks to bring about a settlement of the trouble. This sum was paid in a check made out to the order of R. A. McCord, who in turn endorsed it to Parks, who collected it. This check, with its endorsements, has been turned over to the District Attorney of New York, who has taken criminal action against Parks. After a preliminary hearing Parks was held in bail to the amount of $5000. In the meantime two other charges of extortion were lodged against him by Louis Brandt, a New York City builder, and Herman Lobel, president of the Lobel-Andrews Company, manufacturers of bronze and structural iron work.

The directors of the Hecla Iron Works have caused a double guard to be stationed around the plant at night because of the fact that the Ætna Insurance Company have canceled the fire insurance policy on the property, this step being attributed to the fact that the owners of the iron works have taken so radical a step in opposition to the element in organized labor represented by Samuel J. Parks. The arrest of Parks in this case, taken in conjunction with the split in the Board of Building Trades, is a significant feature of the present labor situation in New York. By many it is held to be the beginning of the end of the walking delegate as a factor in the industrial situation.

New York.

NEW YORK, June 10, 1903.

Pig Iron.—A somewhat better movement has developed and there are indications of a little more interest in the market. Reports from the South are to the effect that some of the outside furnaces are quoting below the level established by the association furnaces last week. We quote, nominally, for delivery at New York and tidewater: Northern No. 1, $20 to $21; No. 2 Foundry, $19 to $19.50; No. 2 Plain, $18.50 to $19. Tennessee and Alabama brands, No. 1, $19.50 to $20; No. 2, $19 to $19.50, and No. 3 Foundry, $18.50 to $19.

Steel Rails.—The meeting of the Steel Rail manufacturers has not yet taken place. We continue to quote $28 for Standard Sections, at Eastern mill.

Cast Iron Pipe.—In addition to the tonnage reported as coming up in Brooklyn last week, bids have been asked for 7000 tons more. None of the large orders in the market has yet been closed. We quote for carload lots of 6 and 8 inch, $36.50 per gross ton, at tidewater, and $35.50 for 12-inch and upward.

Finished Iron and Steel.—No transactions of any magnitude are reported locally. In the case of the many large jobs which can be reached by water deliveries of material are going on, in the case of others work is suspended. The Plate makers met last week and reaffirmed prices. We quote, at tidewater, as follows: Beams, Channels and Zees, 1.75c. to 2c.; Angles, 1.75c. to 2c.; Tees, 1.80c. to 2c.; Bulb Angles and Deck Beams, 1.90c. to 2.25c. Sheared Steel Plates, in carload lots, are 1.85c. to 2c. for Tank, 2c. to 2.10c. for Flange, 2.10c. to 2.20c. for Marine and 2.35c. upward for Fire Box. Refined Bars are 1.80c. to 2c.; Soft Steel Bars, 1.75c. to 1.90c.

Old Material.—With the exception of Steel, which continues firm, the market is extremely dull, buying having practically ceased. Prices are, therefore, largely nominal, as needed, f.o.b. cars, per gross ton:

Old Iron Rails	$23.50 to $24.00
Old Steel Rails, long lengths	22.00 to 22.25
Old Steel Rails, short pieces	19.25 to 19.50
Relaying Rails, heavy sections	27.00 to 28.00
Relaying Rails, lighter sections	29.00 to 30.00
Old Car Wheels	19.50 to 20.00
Old Iron Axles	28.50 to 29.50
Old Steel Car Axles	25.50 to 26.50
Heavy Melting Steel Scrap	19.25 to 19.50
No. 1 Railroad Wrought Scrap Iron	20.00 to 21.00
Iron Track Scrap	19.00 to 20.00
Wrought Pipe	15.00 to 16.00
Ordinary Light Iron	11.00 to 12.00
No. 1 Machinery Cast Scrap	17.00 to 17.50
Stove Plate	12.50 to 13.00
Cast Borings	9.50 to 10.00
Wrought Turnings	15.00 to 15.50

The New York Machinery Market.

NEW YORK, June 10, 1903.

The demand in general continues rather light with a marked falling off in inquiries also. Fortunately the labor atmosphere, which has caused intending purchasers to hold back their orders, is beginning to clear up a little, and as soon as this trouble is settled it is thought that there will be a change for the better.

We understand that the Brooklyn Rapid Transit Company are asking bids for the equipment of their proposed large power plant to be located at Kent avenue and Division street, Brooklyn. The company have been in need of a greater supply of power for some time and have had in contemplation the erection of a plant of probably 50,000 horsepower. Some time ago estimates were placed before the directors for their approval, and now it seems that they have decided to construct the plant. General Superintendent Thomas E. Murray, 55 Duane street, New York, has the matter in charge.

Purchases of the heavier class of machinery are now being made by the Ingersoll-Sergeant Drill Company for their new shops at Phillipsburg, N. J. A large list, covering the machine tools and light machinery, is being prepared and it is expected that this will be shortly issued. The plant will consist of 20 large buildings, including pattern shop, 60 x 160 feet; foundry, 160 x 500 feet; two buildings to be devoted to the building of air compressors, 100 x 260 feet each; erecting shop for air compressors, 120 x 320 feet; power station, 100 x 150 feet, forge shop, 80 x 120 feet; drill erecting shop, 50 x 160 feet; drill repairing shop, 25 x 160 feet; drill manufacturing shop, 160 x 325 feet, and tool department, 100 x 150 feet. The buildings are to be connected by spurs with the Delaware, Lackawanna & Western Railroad.

The Hyle Steel Tool Company of Syracuse, N. Y., advise us that they will purchase about 12 polishers, 100 grinders, milling machines and lathes for their new plant, the particulars of which are printed in another column.

The Harrisburg Mfg. & Boiler Company, Harrisburg, Pa., inform us that they are in the market for a heavy punch, spacing table, steam hammer and jib cranes for the boiler department, and a planer and boring mill for the machine department. Some time ago the company let the contract for the construction of a new building, but the Dauphin Bridge & Construction Company of Dauphin, Pa., who had the contract for the structural steel were burned out, and shipment was delayed. The material will soon be on the ground and the erection of the building will be started within the next few weeks.

About $100,000 worth of equipment, comprising a large power plant, refrigerating plant, pumps and conveying machinery, is required by the New York Butchers' Dressed Meat Company, 510-512 West Forty-second street, New York, who are to erect a $500,000 abbatoir on Eleventh avenue, between Thirty-ninth and Fortieth streets. Last September the company had plans for the plant prepared, but were prevented from starting work of erection by the Board of Health, who only granted them a permit last week. As soon as the plans are passed by the Building Department the company will proceed with the construction of the building, which will be 98 x 125 feet, five stories high. No contracts have been let.

It is thought in the trade that M. S. Friede of 71 Broadway, New York, who recently went to Europe, is over there on business connected with the Trans-Caspian Railway, which is now under construction by the Russian Government. Specifications are being prepared, and it is likely that some important contracts for American supplies will soon be let. Mr. Friede is expected home the latter part of the month.

The Richmond, Fredericksburg & Potomac Railroad Company, Richmond, Va., are purchasing additional tools and machinery for their shops in that city, which are being enlarged. W. D. Drake is general manager.

Frank Klepetko of 8 Bridge street, New York, is now receiving bids for the boilers and generators for the new smelting plant of the Cerra De Pasca Mining Company of Cerra De Pasca, Peru, and as soon as contracts for these have been closed the matter of auxiliary mechanical appliances and machinery will be taken up. Purchases so far made include two blowing, five blower and two dynamo Corliss engines, aggregating 4000 horse-power, from the Nordberg Mfg. Company of Milwaukee, Wis., and five pressure blowers from the P. H. & F. M. Roots Company of Connersville, Ind. It will be recalled that this mining company intend working an ancient copper property in Peru and erecting a 1000-ton smelter. J. B. Haggin, the Pacific Coast capitalist, is the financial supporter of the enterprise.

A large water power project calling for initial equipment of about $110,000 worth of turbines and electrical equipment has taken shape in the organization of the New England Water Power Company with a nominal capital of $100,000. The company propose to develop the water powers at the source of the Farmington River in the western part of Massachusetts to generate power to be electrically transmitted to the various cities in the vicinity of Springfield, 20 miles distant. While there are to be two plants of 5000 horse-power each, the company will take them up separately and let contracts for the construction and equipment of one before starting work on the other. Plans are now being prepared for the first development, and within the next two or three weeks bids will be asked for the construction and equipment. This will be located at New Boston and will involve an outlay of about $1,000,000. Daniel D. Giles of 27 William street, New York, treasurer, has the matter in charge. C. L. Flint of Boston is president, and Charles H. Maxcy of New York is vice-president and manager.

A short time ago we stated that the New York, Chicago & St. Louis Railroad Company of Cleveland were to enlarge their shops at Conneaut, Ohio. W. L. Gilmore, superintendent of motive power, informs us that they have arranged for the following tools: Seventy-nine-inch driving wheel lathe, 300-ton hydrostatic wheel press, 2000-pound single frame steam hammer, No. 5 boiler plate bending rolls, 6-foot No. 2 radial drilling machine, 14-inch slotting machine, 36 x 36 inch by 14 foot planer, Niles-Bement-Pond Company, New York; No. 4 upright milling machine, R. K. Le Blond Machine Tool Company, Cincinnati, Ohio; No. 2 turret brass lathe, American Tool & Machine Company, Boston, Mass.; 14-inch improved engine lathe, Lodge & Shipley Machine Tool Company, Cincinnati, Ohio; 37-inch boring and turning mill, Bullard Machine Tool Company, Bridgeport, Conn.; six roll double cylinder planing, matching and jointing machine, and improved combination vertical hollow chisel mortising machine, J. A. Fay & Eagan Company, Cincinnati, Ohio.

Chicago.

(*Later.*)

Sales are reported of 3000 tons of Wire Rods at $36, Pittsburgh, and 200 tons, ditto, at $37.50, Chicago, for delivery at a Western point.

The American Rolling Mill Corporation have definitely decided to extend their plant at Fort Wayne, and install new equipment. Engineers are on the ground to-day and details will be available next week.

HARDWARE.

HARDWARE manufacturers in general do not appear to be seriously disturbed by fear of strikes or labor difficulties, but have a somewhat uneasy feeling as if there might be the development of friction at any time. There is less apprehension on this score than would otherwise be the case, in view of the fact that in the production of many kinds of Hardware there is comparatively little skilled labor employed, most of the operatives being engaged in tending machines or doing work a sufficient knowledge of which can readily be acquired in a short time. The signs which are frequently seen: "Boys Wanted" or "Girls Wanted," are characteristic to some extent of manufacturing methods in lines where it is not necessary to have a large proportion of skilled workmen. In such cases there is naturally comparatively little ground for apprehending serious labor troubles, as the ranks of any discontented employees could readily be filled up by new recruits. The condition is quite different where skilled labor is essential to the production of the goods, but this is not so generally the case as is often supposed.

The Church Bell.

A retail Hardware merchant receives an inquiry for a Church Bell of given quality and weight, for use in a new church in his town.

The merchant obtains from a jobbing house a quotation on the Bell, adds 10 per cent. profit, and names the price to the Building Committee.

The Building Committee tell him that they are able to do better by purchasing from a catalogue house, who quote them a price substantially the same as the retailer's cost from the jobber.

The merchant takes up the matter with the jobbing house, mentioning the price at which the church can buy the Bell from the catalogue house, and protesting that it is not right that his customer should be able to purchase the Bell as cheaply as he.

The jobbing house reply that they added only a moderate percentage of profit to their cost, the catalogue house having purchased the Bell from the manufacturer at the same price as the manufacturer quoted the jobber.

The result was that the Building Committee bought the Bell from the catalogue house.

Were the Building Committee to blame for buying the Bell from the catalogue house?

Was the retailer right in going to the jobber instead of direct to the manufacturer?

Should the jobber in any way be held responsible for the fact that the Bell was purchased through the catalogue house and not from the Hardware merchant?

Was the manufacturer right in making the catalogue house the same price as the jobber?

An impression prevails to some extent that, owing to the activity of the home market and the higher prices ruling in some cases, there has been a falling off in the exportation of Hardware during the past year or two. The most recent statistics of the Treasury Department, however, bearing upon this question, show that there is little ground for this opinion, inasmuch as the volume of Hardware exports has lately been greater than at any time in the history of the trade. These statistics show that the value of Builders' Hardware, Tools, &c., exported during the ten months ending April 30, 1903, was $9,850,185, as against $7,884,886 for the corresponding period of 1902, and $7,619,109 for the corresponding period of 1901. As showing that the tendency toward increased exportation of these lines still continues, it is interesting to note that the value of these goods exported in April, 1903, was $1,115,490, as compared with $1,066,598 in 1902. Although Cutlery has never been an important factor in foreign trade, it will be seen that there has of late been satisfactory progress in this line, inasmuch as the value of Cutlery exported in the ten months ending April 30, 1903, was $257,145, as compared with $189,540 during the ten months of 1901, and $212,461 during the corresponding period of 1902. Firearms, Cash Registers and Sewing Machines are lines which show a notable increase, and which are becoming important articles of export trade. In Nails, Wire and Cut, Tacks, &c., the trade of 1903 shows a slight gain over 1901, and a large and important gain as compared with 1902. This growth in foreign business, notwithstanding the pressure of the home market and the urgency of the demand, is a very satisfactory indication of the relation of American manufacturers to distant markets, and is significant of the success which will attend their efforts to capture such markets when the home pressure relaxes and prices recede from their present relatively high level.

Condition of Trade.

So far as Hardware manufacturers are concerned, business is less pressing than it has been, and there is a perceptible falling off in the quantity of goods covered by current orders. The larger trade are holding off a little in the purchase of goods for next season, and giving their attention to the marketing of their present stocks, which, notwithstanding the active demand made upon them, are on most lines ample for requirements. While not, perhaps, in the aggregate serious in their influence on business, the various disturbing occurrences which have commanded the public attention, such as strikes, floods, drought and especially the course of the stock market are having some effect on the volume of business and the general feeling of the trade. The result is that there is something of a letting up in the fierce pace which has been so long maintained, and merchants and manufacturers are taking breath and sizing up the situation. Meanwhile manufactured products are steadily going into consumption and retail merchants generally are doing a fine business. The outlook, too, for crops, notwithstanding the injuries suffered in some sections, is regarded as excellent. The prospect that unreasonable dictation of trade unions will be checked by the united efforts of the employers is having a good effect on the tone of the public feeling, as it is hoped that in this way a serious menace to our permanent prosperity may be rendered less threatening. The high prices are having some influence in deterring enterprise, and for this reason the declining tendency in the market for raw material is generally conceded to be wholesome and likely, if it does not go too fast and too far, to be for the advantage of the trade. Prices for Hardware articles continue remarkably steady. Very few lines have to be characterized as weak, and in many the manufacturers are still a good deal behind in their orders.

Chicago.

(By Telegraph.)

An increased volume of business has been transacted in Heavy Hardware lines during the past week, the orders being well distributed, including Black and Galvanized Sheets, Tin Plate, Bolts, Nuts, Rivets, Screws, Washers, Bars and similar material. Agricultural Implement manufacturers and car works have continued to place some liberal sized orders for Bolts and Nuts especially, and in large quantities. There is evidence that concessions in prices have been made, but as far as the general trade is concerned prices are well sustained. Horseshoes have sold well, but Chain has been dull and weak. There has been little if any relief in the stringency already noted in the market for Washers, and Tin Plate is scarcer than ever. With Pig Tin in more ample supply and lower, dealers express surprise at the difficulty of obtaining Tin Plate. The scarcity, of course, is due to the inability of obtaining Tin Plate Bars, which condition has been noted from time to time in the market for heavy material. The prospect of relief, too, from this condition is unfavorable under 60 days at least. Black and Galvanized Sheets, however, are in ample supply, and, as a rule, prompt shipments can be made. General manufacturers have bought more freely of Screws, but in not a few instances have given preference to the jobber, who, with large stocks purchased at lower prices, is still able to undersell the manufacturer who is maintaining prices firmly at the recent advance. Manufacturers of Saws and Edged Tools are having an opportunity to catch up a little more on back orders, as new business has not been so pressing. However, quite liberal orders are expected for fall and later delivery during the current month. The scarcity noted in Snaths and Scythes continues to be a prominent feature of the local jobbing market, there being but one company having a surplus, and that being rapidly depleted. Manufacturers' agents are making some efforts to secure orders for Curry Combs and Saddlery Specialties, which are reported to be a little firmer in tone for next year's delivery. Some advance orders are being received for Back and Cross Cut Saws. The prices on the former, however, are said to be irregular. An occasional order is still being placed for fall line of goods, such as Stove Boards, Stove Pipe Elbows, Coal Hods, Axes, Lanterns, Scoops, &c., but, as a rule, most of this business has been placed, and deliveries, it is thought, will be made earlier than usual this year. Some manufacturers' agents note the reception of liberal orders for Blank Cartridges, more especially from the country trade, as the action of the city authorities has cut off the independence day's sale of these goods in Chicago materially this year. Retailers are having a moderate demand for Lawn Mowers, Ice Cream Freezers, Refrigerators, Screen Doors and similar lines of summer goods, but the weather has not been warm enough to stimulate the consumptive trade, and jobbers are receiving fewer repeat orders than usual. The scarcity of Black Wire Cloth, especially in the large sizes, is again noted as a feature of some interest. Recent reports indicate that the Hardware jobbers are working up a steadily increasing trade in Cut Oak Soles and Taps, these leather goods finding a ready sale throughout the country to the farming interest. Manufacturers have found jobbers a good distributive channel for a class of material that does not find ready sale through the shoe finding houses. Liberal orders have recently been received by manufacturers' agents for Cut Soles and Taps for August, September and October deliveries from various points in the Central North and Far West. Trade in Builders' Hardware has fallen off rather than otherwise, even the orders from the country being less liberal. The time for receiving bids for the traction building at Indianapolis will close on Saturday next, and the trade is anticipating a call for bids on the Pennsylvania Railway (Washington) Depot within a short time. Government work is still delayed. The trade in Wire and Nails is steadily falling off, but there is less likelihood of decline in prices this year than for a long time. The largest interest is well sold for several months, but independent manufacturers are less freely supplied with orders for early shipment. The demand for Wire Fencing, however, continues phenomenal, both independent and combination mills being booked heavily, and are being pressed for shipments.

NOTES ON PRICES.

Wire Nails.—There is a fair quantity of Nails being distributed on contract specifications and new orders, under the present condition of labor strikes in building trades. It is also the season when demand usually falls off. The market is firm and more free from irregularities owing to jobbers underselling the manufacturers. Quotations are as follows, f.o.b. Pittsburgh, 60 days, or 2 per cent. discount for cash in 10 days:

Jobbers, carload lots	$2.00
Retailers, carload lots	2.05
Retailers, less than carload lots	2.15

New York.—Demand keeps up remarkably well under the ruling conditions, which have almost paralyzed building operations in this city and adjoining territory. Dealers' stocks are generally low, and orders call for immediate shipment, as requirements are confined to assorting up quantities. The market is firm at the following quotations: Single carloads, $2.20; small lots from store, $2.25 to $2.30.

Chicago, by Telegraph.—There has been a further falling off in the volume of new business received, but specifications on previous commitments have been freer and the mills are busy, shipments being made more promptly. The market remains firm, however. The jobbing trade has been only moderately active. Official quotations continue steady at $2.15 to $2.20 in carload lots, f.o.b. Chicago. Broken cars sell at 5 to 10 cents higher. For galvanizing 75 cents per keg and for tinning $1.50 extra per keg is charged.

Pittsburgh.—Current demand for Wire Nails is only fair, most of the business being shipped out by the mills being old contracts placed some time since. Specifications on these contracts are coming in at a fairly satisfactory rate. Prices are being well maintained and are as follows: $2 in carloads to jobbers, $2.05 in carloads to retailers and $2.15 in small lots, f.o.b. Pittsburgh, 60 days, or 2 per cent. discount for cash in 10 days; for galvanizing Nails 75 cents per keg is charged and for tinning Nails $1.50 per keg extra.

Cut Nails.—The output now is about equal to the demand, so that the difficulty of obtaining prompt shipments is practically over. The market is firm and quotations are as follows: $2.15, base, in carloads and $2.20 in less than carloads, f.o.b. Pittsburgh, plus freight in Tube Rate Book to point of destination; terms 60 days, less 2 per cent. off in 10 days.

New York.—Cut Nails are in steady but decreased demand, on account of the continued labor troubles in the building trades. Requirements are, however, up to the expectations of jobbers, under these conditions. The market remains firm and quotations for carloads and less than carloads are as follows: Carloads on dock, $2.29; less than carloads on dock, $2.33; small lots from store, $2.40.

Chicago, by Telegraph.—There is less complaint of not receiving goods on contract time, but the demand has not been especially active, either for mill or store shipment. Prices have continued steady as previously quoted, in harmony with the recent action of the Cut Nail association. The demand continues to be met on the basis of $2.30 in carload lots and $2.35 in less than carload lots for Steel, Chicago. Iron Nails are held at $2.45 to $2.50 per keg from store.

Pittsburgh.—There is only a fair amount of new business being placed in Cut Nails, demand having been restricted very much by the labor strikes prevailing all over the country. Mills are now able to make prompt shipments. Prices are fairly firm and are as follows: Steel Cut Nails, $2.15, base, in carloads and $2.20 in less than carloads; Iron Cut Nails, $2.25, base, in carloads and $2.30 in less than carloads, plus freight in Tube Rate Book to point of destination, 60 days, less 2 per cent. off in 10 days.

Barb Wire.—The bulk of demand appears to be about over for the season. Current orders are light, but specifications on contract orders are being received by the mills in fair volume. Quotations are as follows, f.o.b. Pittsburgh, 60 days, or 2 per cent. discount for cash in 10 days:

	Painted.	Galv.
Jobbers, carload lots	$2.30	$2.60
Retailers, carload lots	2.35	2.65
Retailers, less than carload lots	2.45	2.75

Chicago, by Telegraph.—Specifications on previous contracts have been received to a liberal extent, but new business has continued to decline, as is always anticipated at this season of the year. An accident to some of the mills in this section will cause a suspension temporarily, but there is enough active capacity to supply orders promptly. The jobbing trade has continued moderately satisfactory. Galvanized Wire is selling on the basis of $2.75 to $2.80 in carload lots and Painted at $2.45 to $2.50, the outside price being to retailers. For small lots 5 to 10 cents extra is charged. Staples in carload lots sell as follows: Polished, $2.30 to $2.35, and Galvanized, $2.70 to $2.75, the outside price being to retailers.

Pittsburgh.—The season is pretty well over, and demand for Barb Wire is altogether for small lots. Prices are firm, and we quote, f.o.b. Pittsburgh, 60 days, or 2 per cent. discount for cash in 10 days: Painted, $2.30; Galvanized, $2.60, in carloads to jobbers; Painted, $2.35; Galvanized, $2.65, in carloads to retailers; Painted, $2.45; Galvanized, $2.75, in small lots to retailers.

Smooth Fence Wire.—Demand varies in different sections of the country at present. Mills are, however, busy filling contract orders, and will be kept busy for some time. The market is firm at the following quotations, f.o.b. Pittsburgh, terms 60 days, or 2 per cent. discount for cash in 10 days:

Jobbers, carloads	$1.90
Retailers, carloads	1.95
Less than carloads	2.05

The above prices are for base numbers, 6 to 9. The other numbers of Plain and Galvanized Wire take the usual advances, as follows:

	6 to 9	10	11	12&12½	13	14	15	16
Annealed	Base.	$0.05	.10	.15	.25	.35	.45	.55
Galvanized	$0.30	.35	.40	.45	.55	.65	1.05	1.15

Chicago, by Telegraph.—The demand for Wire Fencing has continued phenomenally active, but new orders for Wire are falling off. Otherwise the situation is without change or significance. The market remains firm in tone, the following being the prices obtained: Nos. 6 to 9 sell at $2.05 to $2.10 in carload lots on track, and $2.15 to $2.20 in less than carload lots from store, Galvanized bringing 30 cents extra for Nos. 6 to 14 and 60 cents extra for Nos. 15 and 16.

Pittsburgh.—Demand is for small lots only, the mills running mostly on old contracts placed some time since. There is no change in prices, which are as follows: Plain Wire, $1.90, base, for Nos. 6 to 9 in carloads to jobbers, $1.95 in carloads to retailers and $2.05 in small lots to retailers; Galvanized, 30 cents extra for Nos. 6 to 14 and 60 cents extra for Nos. 15 and 16.

Paris Green.—Weather conditions have not been conducive to an increased demand. This state of affairs has continued for some weeks, and has obviated the necessity of duplicate orders. Manufacturers are now filling contract orders as specifications are received. In the absence of demand former quotations fairly represent the market, as follows:

Less than 1 ton.	Per lb.
Arsenic kegs or casks	13½c.
Kegs, 100 to 175 pounds	14c.
Kits, 14, 28, 56 pounds	15c.
Paper boxes, 2 to 5 pounds	15c.
Paper boxes, 1 pound	15½c.
Paper boxes, ½ pound	16c.
Paper boxes, ¼ pound	17c.

One to 5 tons, 1 cent per pound less; 5 tons and over, 1½ cents per pound less.

Cordage.—The demand for Rope, together with the number of spindles engaged on Binder Twine, is preventing manufacturers accumulating stocks to any extent. Quotations are as follows, on the basis of 7-16-inch and larger: Sisal, according to quality, 9 to 10 cents; Manila, on the same basis, 12 cents per pound. A rebate of ¼ cent per pound is allowed on large lots.

Glass.—The meeting referred to last week was held in this city on June 5. After discussing the situation the meeting was adjourned to Pittsburgh. In comparing notes the Glass jobbers have arrived at the conclusion that their stocks are very much depleted in assortment, and that if a brisk demand springs up after the labor strikes in building trades in this part of the country are settled they will need more Glass at once. They acknowledge, however, that if the present lack of business continues they have sufficient Glass for a long time. It has been learned upon responsible authority that at present the American Window Glass Company do not expect to introduce their Glass blowing machine into the Glass situation next fall. It is expected that manufacturers will insist upon cutting down workmen's wages 20 to 25 per cent. for next fire. Of course the men will fight against this reduction, which means a late start of the factories. It is presumed that the price of the smaller sizes of Glass will then be put at a figure which will lessen the profit of importing Glass. This is a tentative outline, supposedly in the minds of the Glass combines for the fall campaign. A late report of the Glass blowing machine is to the effect that it will make small sizes, but does not work well on large sizes, and that it will not make double strength in its present form.

Spirits Turpentine.—Business has been confined almost entirely to small lots, although the market is a trifle stronger than last week. Quotations, according to quantity, are as follows: Southerns, 49½ to 50 cents; machine made barrels, 50 to 50½ cents per gallon.

Oils.—*Linseed Oil.*—The demand continues for small lots of Oil, with almost nothing in the way of contract orders for future delivery. The stopping of building operations in this territory has, no doubt, affected demand to a considerable extent. City Raw is quoted at 44 cents per gallon in lots of five barrels or more, and out of town Raw at 41 cents in like quantity.

A WELL ARRANGED ADVERTISEMENT.

BY E. D. D.

ONE of the greatest and most common mistakes made in advertising is that of trying to put too much matter into one advertisement. Another error often made is that of advertising too great a variety, too many different kinds of goods at one time. A well arranged advertisement of Fishing Tackle is shown in the accompanying cut. The Sweet-Packard Company are one of the largest Hardware retailers in Troy, and for three years have been making a specialty of Sporting Goods. The wording of this ad is good, and the bringing out in a prominent way of Fishing Tackle and the special leader of a split Bamboo Rod is excellent. The only way that the advertisement might have been improved would have been to have had under the firm name, in small type, the words, "The Hardware Store." Fishing Tackle is only a side line with the company, and by some people may be considered Hardware, at the same time it is always well to keep the principal business before

A Good Advertisement.

the public. However, for the purpose of selling the line advertised it would not be easy to get up a better ad for the amount of space used.

DEATH OF GEORGE F. WRIGHT.

GEORGE F. WRIGHT, president of the Wright Wire Company, died at his home in Worcester, Mass., Saturday, May 30, after an illness of but six days, although he had been partially paralyzed for eight years.

Mr. Wright was born in Westford, Mass., in 1831, and was educated at Westford Academy. He learned and worked at the cabinet maker's trade, and in 1858 became a partner with Burt, Wright & Co., Harvard, Mass., manufacturers of horse powers and other machinery. Later he was one of the firm of A. & G. F. Wright until the Civil War.

In 1862 Mr. Wright entered the employ of the Clinton Wire Cloth Company, and was soon put in charge of building their machinery and buildings, he having made the plans for the first tower for painting Wire Cloth used in Clinton, which was burned a few years ago. He remained in Clinton 20 years as master mechanic, and left to establish himself in business in Palmer, Mass., in 1883. The name of the concern was the Wright Wire Cloth Company. In 1889 the business was established in Worcester and was organized as the Wright & Colton Wire Cloth Company, the officers being George F. Wright, president; Samuel H. Colton, treasurer; George M. Wright, general manager; Herbert N. Wright, secretary. Mr. Colton retired from the firm in 1899. The business begun at Palmer employed six workmen. When the Worcester factory was started 60 men were employed. Now the Worcester factory employs 500 workmen, and the Palmer plant, with tenements, &c., covers 40 acres, employing 100 hands.

GEORGE F. WRIGHT.

Mr. Wright was a natural mechanic and was the inventor and patentee of from 20 to 30 patents on machinery for the weaving and working of Wire Goods, embracing looms, shuttles, wire cloth painting machines, paint rolls, poultry netting machines, wire papering machines, &c.

His patent paint rolls are said to have been the first successful rolls and best method for painting Wire Cloth by machinery. They were used many years in painting millions of square feet of Window Screen Wire Cloth annually. He was the first to take out a patent, in the 60's, for a machine for covering paper boxes and using continuous ribbon paper, an invention which has been embodied in every box covering machine in the country for many years.

He is survived by a widow and two sons, George M., vice-president and general manager of the Wright Wire Company, and Herbert N., assistant treasurer and superintendent of the same works.

AMONG THE HARDWARE TRADE.

The J. A. Brown Hardware Company have succeeded J. A. Brown & Sons in the Hardware (Shelf and Heavy), Stove, Tinware, Paints and Oils and Sporting Goods business in Fort Collins, Col.

Johnson Grover, Colusa, Cal., has transferred his Hardware, Stove and Agricultural Implement business to George W. Tibbetts and W. W. Wilson, who will continue at the old stand under the style of Tibbetts & Wilson.

J. P. Lawton and Polk Harris have purchased the interest of C. P. Bush in the Bush Hardware Company, Columbus, Ga., Mr. Bush retiring to go into the manufacture of Buggies and Carriages. Messrs. Lawton and Harris have thus become sole proprietors, Mr. Lawton being president and Mr. Harris secretary and treasurer of the company. The wholesale and retail business will be continued, as in the past, under the style of the Bush Hardware Company.

Andrews Hardware Company, North Bend, Neb., have been incorporated with a capital stock of $7000, succeeding Hines & Cherney in the retail Shelf and Heavy Hardware, Stove, Tinware, Paints and Oils and Sporting Goods business.

The business heretofore conducted by J. J. Post & Co., Cheboygan, Mich., has been incorporated under the name of the J. J. Post Hardware Company, Limited, with the following officers: J. J. Post, chairman; Frank McIntire, treasurer, and Schuyler Farrell, secretary. The lines handled by the company include General Hardware, Stoves, Tinware, Wagons and Buggies, Agricultural Implements, General Mill Supplies, and plumbing and steam, hot air and hot water heating.

Stone & Co. are a new concern at East Gilead, Mich., handling Shelf and Heavy Hardware, Stoves, Tinware, Agricultural Implements, Paints and Oils, Wagons and Buggies and Harness.

C. E. Lawrence Company, in the Hardware, Stove, Farming Implement, plumbing and heating business, at Hillsdale, Mich., have disposed of their stock and good will to the Hillsdale Hardware Company, who will continue at the old stand, where Mr. Lawrence has been located for the past 35 years. The members of the new concern are Geo. N. Smith, for many years connected with Mr. Lawrence, Adam Wiseman and F. C. Fuller.

MRS. MARY MCCARTHY will continue the business of her late husband, Eugene McCarthy, 312 Bastable Building, Syracuse, N. Y., having associated herself with Henry G. Saul, an experienced and traveling salesman, to represent as manufacturers' agents the following concerns—viz.: American Tube & Stamping Company, Arthur C. Harvey Company, Goff, Horner & Co., Fuller Bros. & Co., J. Wood Bros. & Co., Cleveland Galvanizing Works, Union Steel Screw Company, Baltimore Tack Company, Duncannon Iron Company, Marshallton Iron & Steel Company, Mt. Carmel Bolt Company, Keystone Stove Board Company, Bostwick Steel Lath Company and several others.

RONBERG & Co., Ashtabula, Ohio, manufacturers of Iron and Coal Mining Shovels, have been incorporated as the Lake Erie Mfg. Company, and will engage in the manufacture of a complete line of Shovels.

A FACTORY HOSPITAL.

THE CLEVELAND HARDWARE COMPANY, Cleveland, Ohio, manufacturers of Vehicle Hardware, have satisfied themselves that the temporary hospital established by them last September as an experiment has abundantly justified its existence, both from a humanitarian and business point of view, benefits accruing to workman and company alike. For instance, it often happened that an employee receiving a slight wound would not properly cleanse it, and would often wrap a piece of dirty cloth around it, with the almost inevitable result that in three or four days the injury would begin to fester and cause trouble, often becoming a serious matter, as well as keeping a valued employee from work, while intelligent care at first would have prevented all this. This entailed financial loss to the employee and was sometimes the basis for damage claims for which frequently the company was in no way responsible, but which nevertheless was a source of annoyance and loss.

Hospital Equipment.

The company have fitted up and suitably equipped a temporary emergent hospital room, formerly a small office, measuring about 8 feet square. It is located about in the center of the plant for greater convenience. In renovating it the interior was painted with a white enamel, an enameled wash basin put in, together with hot and cold water. Then followed a small glass top surgeon's table, two chairs, a rattan couch, rubber and woolen blankets, towels and other accessories. In the room in proper receptacles are kept liniments, salves, headache powders, cholera remedies, &c.

Method of Treatment.

When an accident occurs the injured employee is taken directly to the hospital and the wound washed and cleansed. The first dressing is given at the hospital, and in the event of inability to return to work or go home, owing to shock, the patient remains in the room until he can be removed to his home or a regular hospital, as the case demands.

Record of Accidents.

All accidents are reported immediately to the office, using a blank form 6¾ x 11 inches, as shown herewith reduced, with a blank order at the bottom to be filled out, if necessary, and torn off along the perforated lines, for the doctor or hospital to which the patient is sent:

REPORT OF ACCIDENT.

Name..... Address.....
Age..... Married or single..... Dep't.....
Date..... Hour.....m. Light.....
Nature of injury.....
Sent home..... Sent to what hospital.....
Doctor..... Address.....
Probable period of disablement. .....
Names of witnesses.....
What statement, if any, made.....
What was cause.....
Signed.....
Date.....190..
....190..
.....
Please render necessary immediate aid to.....
.....
Send bill to us, attaching this order.
THE CEVELAND HARDWARE COMPANY.

This detached order is to be used at the discretion of the person in charge, in the event of professional medical or surgical attendance being necessary, the cost of which is paid by the company in due course, according to the circumstances of the case.

Amateur Hospital Chief.

The service is under the supervision of E. E. Adams, general superintendent, who has been associated with the men for ten years, and took a course in "first aid to the injured" some years ago, which fits him for the work. Throughout the factory permanent boxes are placed containing clean cotton bandages, and a stretcher is kept available at all times. When a man does not feel quite right, without being ill enough to quit work, he is allowed to go into the hospital during the noon hour for rest, at the discretion of the superintendent.

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HARDWARE FACTORY COST METHODS.

WE give below a description of methods used by the Cleveland Twist Drill Company, Cleveland, in connection with their cost system. It will be observed that two forms of blanks are used; one for their regular goods for stock, and the other for special orders.

CLEVELAND TWIST DRILL COMPANY'S MANUFACTURING COST SYSTEM.

Regarding their system of keeping costs, the Cleveland Twist Drill Company, Cleveland, Ohio, say that

Form 101. CLEVELAND TWIST DRILL CO. PIECE WORK CARD. No. 3002 SOFT

ORDER NO. _____ DATE Feb 17th

No. Pieces	2	Size 1/8	Kind Taper Shank Drill		
Filing { Heel / Taper				Date	
Hand Burring		Chas Towne		Feb 17	.003
Mech. Burred		S. Gonder		" "	.002
Back Cleared No. Machine	1/4 hr	H. F. Schmitt		" 18	
Grinding Points		G. Friedle		" "	.009
Wheeled Soft 1st		F. Korth		" "	.003
Shanks Ground Burred		" "			.002
Hand Burred After Grinding					
Burred Points		F. Mills		" 18	.002
Polishing Flutes		C. Blood			.006
Lining					
Flaws		Feb 18th 1903			

Feb 14th 1903

No. Pieces		Size	Kind	No. 3002 HARD	
Tempered					
Oil Brushed					
Dry Cleaned					
Straightened No. Broken		J. W. —		Feb 23	
Buffing Blued Flutes					
Oil Brushing Blued Flutes					
Dry Cleaning Blued Flutes					
Buffing Points		J. Smith			.004
Back Cleared					
Cloth Wheeled		F. Schultz		" 24	.002
Wheeled 2d					
No. Spoiled		O. K. M. T. — foreman			
No. 3d Class					
Flaws		Feb 24th 1903			

Fig. 1.—Piece Work Card for Regular Goods.

their business differs materially from that of many other concerns in that they make a staple article of manufacture, sending through their product in large quantities at a time, the operations being carried on in rotation from start to finish, and each operator being paid so much per hundred pieces handled. Thus the system resolves itself into merely counting the pieces handled by each operator and crediting him with his price for that particular operation. The record for each of these regular jobs is kept on sheets, one of which is reproduced in Fig. 1. One is issued with each lot of work and is placed in a tin receptacle, shown in Fig. 2. This protects the slip from being soiled by the workmen's hands. A superintendent or clerk issues the order, puts down on the slip the number of pieces to be handled, and each operator puts his name and the date he handles the work in the blank space opposite the particular job which he is working on. This same operation is repeated by each succeeding man handling the lot.

Stock Orders

It frequently happens that goods will be ready for the tempering department, but are not needed in a hurry and are allowed to lie for some time before tempering.

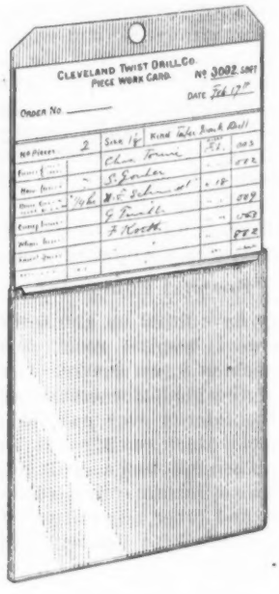


Fig. 2.—Piece Work Card Holder.

In order that the men who have performed the operations up to the tempering can be paid promptly for their work and not wait until the goods are tempered and the finishing operations performed, the slip is perforated as shown in Fig. 1. When the operations on the first half of the sheet are finished it is torn off at the perforations and is sent to the timekeeper's office for the making up of the pay rolls. The lower half follows as soon as the operations on it have been performed.

For keeping track of the cost of the manufacturing of special tools, where but one or a few pieces of a kind are put through at a time, a special shop card, shown in Fig. 3, is issued. This order is made out by the superintendent and follows the job from the raw material to the shipping room, each operator noting in the place on the back, as shown in Fig. 4, his name, time and date. When the job is completed the slip is returned to the timekeeper's office and the total cost of the job is figured and entered on the back, when it is sent to the bookkeeper's department, where the selling price is noted and the invoice issued. To the amount thus obtained on the card is added a certain percentage to include the cost of non-productive labor and the fixed charge of running the business, such as insurance, office expenses, salesmen, &c. When this is finally added to the shop cards the cost of that particular job is supposed to be covered.

Special Orders

TRADE ITEMS.

WHILE the strike of the grinders at the shop of the Nichols Bros., Greenfield, Mass., is nominally still on, the incident is rapidly approaching an end. Thirteen grinders went on strike May 2. No effort was made to fill their places for three weeks. The demand for 25 cents a dozen was granted the Table Knife grinders. The two Butcher Knife grinders then demanded an increase, which was refused, and it was this refusal that prevented a settlement of the difficulty. As soon as the firm decided to fill the strikers' places ten grinders were secured, and arrangements have been made to fill the other three vacant places. The strike may therefore be considered as good as ended.

SEALED PROPOSALS will be received until June 15 for

the installation and maintenance of an electrical burglar alarm device on certain vaults and safes in the United States Treasury Building, Washington, D. C., which device must be connected with a central station. Full particulars may be had from James Knox Taylor, Supervising Architect, Treasury Department, Washington, D. C.

THE stockholders of the National Railway Specialty Company, Old Colony Building, Chicago, at a special meeting decided to change the corporate title to Camel Company, the object being to secure a shorter and more distinct name. J. M. Hopkins is general manager of the company, and P. M. Elliott general sales agent. The Camel Company will make the Security, the Dunham and the Q & C Trolley Car Doors, the N. R. S. Hose Bands, the Camel (formerly National adjustable) Journal Bearings, &c.

ORDER G 12310

KEEP TIME—SHOP ORDER FOR DRILLS. C. T. D. Co.
CLEVELAND, O. Feb 13 — 1903

NUMBER PIECES	Each Workman must put his time on back of order and will be held responsible for his part of this order and all work previously done.	SIZE STEEL	LENGTH TO CUT
1	5/8 Track Drill		
	6" LENGTH OVER ALL	21/32	6 3/8
	KIND OF STEEL Sanderson		
	HARDENED AT LAMP O		
	Promised March 3rd TEMPERED TO GAUGE 13		
	TESTS. HARD	SOFT	
	Weight of steel 1½ lb Grind & Centre both ends		

SENT TO TURN	SENT TO MILL	SENT TO FINISH	SENT TO TEMPER	FINISHED DRAWING	FINISHED GRINDING	FINISHED CLEANING	FINISHED WHEELING
		Feb 26	Feb 27	Mar 3			

Fig. 3.—Special Order Card (Front).

NO TO CUT	1	1-5/8 Track Drill		
WEIGHT STEEL		6" LONG OVER ALL		
OPERATION	NO. PIECES	Price or Time	WORKMAN	Date
Cutting				
Grinding Ends				
Centering				
Pointing				
Turning	1	1 hr	G. Bommer	Feb 17
Flatting	1	1¼ hr	Mike Faccum	" 18
Milling		Piece Work	C. Kugen	" 27
Filing Heel / Taper				
Hand Burring	1	" "		
Mach. Burred	1	" "	S. Sonden	" 27
Back Cleared No. Machine	1	" "	Christ. Gillen	" 27
Grinding Points	1	" "	G. Friedel	" 27
Wheeled Soft 1st	1	" "	T. Short	" "
Shanks Ground Burred				
Hand Burred After Grinding				
Burred Points				
Polishing Flutes	1		C. Bloeden	" 27
Lining				
Tempered	1	10 min	H. David	
Oil Brushed				
Dry Cleaned				
Straightened ~~No. Burned~~	1		O. R. Pier	
Buffing Blued Flutes		-		
Oil Brushing Blued Flutes				
Dry Cleaning Blued Flutes				
Buffing Points	1		J. Armstrong	
Back Cleared				
Cloth Wheeled				
Wheeled 2d				
No. Sent to Stock	1		Mar 3rd 1903	

Fig. 4.—Back of Special Order Card.

THE AMERICAN SEEDING MACHINE COMPANY have decided to establish a branch factory in Canada, and a committee of three, consisting of E. L. Buchwalter, president; James A. Carr, vice-president and chairman of the Executive Board, and Frank R. Packham, manager of the Department of Improvements and Patents, has been appointed to visit the following cities with a view to selecting that one offering the best water, railroad, electric light and power and other facilities: Leamington, Chatham, Sarnia, St. Marys, Stratford, Woodstock, St. Thomas, Brantford, Paris, Ayr, Preston, Hamilton, Guelph, Toronto, Peterborough, Orillia, Collingwood, Alliston, and St. Catharines.

A MEETING of prominent Wind Mill manufacturers was held at the Grand Pacific Hotel, Chicago, June 1, and various matters of interest to that branch of industry were discussed. It is believed that no action will be taken by the manufacturers in regard to change in prices.

THE HARDWARE JOBBERS' PURCHASING COMPANY, Irving Building, Chambers street and West Broadway, New York, held their second annual meeting June 1, at which the following officers were elected for the ensuing year: Francis Van Wyck, president; E. S. Cox, vice-president, and S. Doblin, secretary and treasurer. The company report their business as flourishing, and state that they now have on their books about 60 houses for whom they buy goods.

THE annual meeting of the Pacific Coast Hardware and Metal Association has been postponed until July 8, 9 and 10, when it will be held at the Hotel Potter, Santa Barbara, Cal. The sessions will be devoted to reports on the work of the association for the past year, election of officers for the coming year, and discussions of various topics of interest to the Hardware and Metal jobbing trade of the coast.

J. N. LIMEBURNER, for a number of years with Allerton-Clarke Company, has been appointed sales agent for the recently organized New York Lock Company, Branford, Conn., with headquarters in New York, at 117 Chambers street. This company have bought the factories formerly operated by the Branford Lock Works and all the patents and patterns pertaining to Locks and

Builders' Hardware owned by the Mallory-Wheeler Company, New Haven, Conn. The New York Lock Company will make a specialty of manufacturing a Screwless Spindle Knob and Ball Bearing Cylinder Locks under patents owned exclusively by themselves. A marked characteristic of the Screwless Spindle Knob is that while effective it is simple, and will be made for all kinds of Knobs from the cheapest to the most expensive, at but a slight advance on the price of regular Spindle work.

THE KENTON HARDWARE MFG. COMPANY, Kenton, Ohio, whose plant was burned out on the 18th ult., are rebuilding, and expect to be in full operation within 60 days. The foundry is now at work, and by the time the factory is completed they expect to have quite an accumulation of castings, so that they will be able to go to work immediately with day and night forces to fill orders for the fall trade.

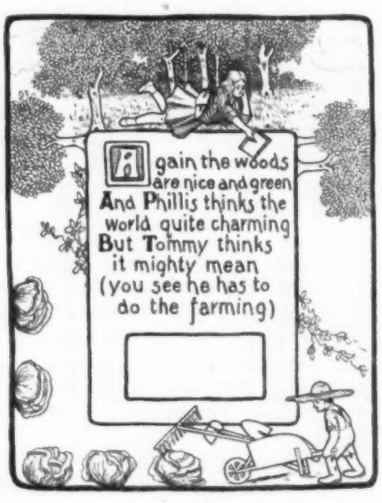
SEALED PROPOSALS will be received as follows for construction work (including plumbing, heating apparatus, electric wiring and conduits): Until June 18 for the United States post office at Boone, Iowa, and until June 22 for the United States post office at Stillwater, Minn. Copies of drawings and specifications can be had by addressing respectively the postmasters at Boone and Stillwater, or by addressing James Knox Taylor, Supervising Architect, Treasury Department, Washington, D. C.

A. J. WRIGHT, who for some years was connected with the Chicago office of the Yale & Towne Mfg. Company, and who in January, 1901, was appointed manager of their New York store and city department, 9-13 Murray street, resigned his position with that company some time ago, to become effective June 1, 1903, and will return to Chicago as the representative of the Lockwood Mfg. Company, South Norwalk, Conn., manufacturers of Locks, Knobs and a complete line of Builders' Hardware, whose product in that territory is marketed by the Allerton-Clarke Company, Chicago. Mr. Wright was also for several years identified with the latter company.

CLARK & PARSONS COMPANY, East Wilton, Maine, advise us that there is no truth in the reports which have appeared in the daily papers referring to the destruction of their Hay Knife and Edge Tool plant. An old saw mill on the opposite side of the stream was burned, together with a dwelling, the saw mill being owned by the company. The loss was unimportant. The trade will thus understand that the company's manufacturing plant has not been injured and is in perfect running order.

FRONT COVER OF SPRING CATALOGUE.

FIRST impressions create an influence to a marked extent, and the cover of a catalogue may exert an important effect on its usefulness. The accompanying

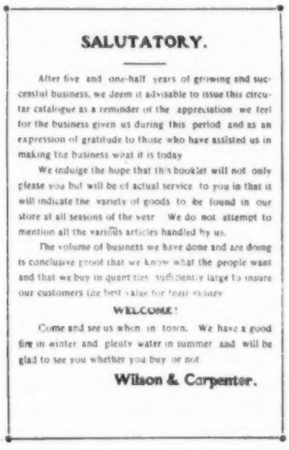

Again the woods are nice and green
And Phillis thinks the world quite charming
But Tommy thinks it mighty mean
(you see he has to do the farming)

Front Cover of Spring Catalogue.

illustration is a reduced reproduction of the front cover of a 20-page catalogue of A. M. Matthews & Co., of Orange, N. J. It is printed on light green paper and in design harmonizes with Garden Implements and Seeds, to which the catalogue is largely devoted. The year, 1903, appeared in the blank space under the verse. In addition to illustrated catalogues of this character which the firm issue frequently, their show windows are relied upon to attract business. The arrangement of these is frequently changed and they are designed to supplement the advertising, both newspaper and catalogue.

AN ATTRACTIVE BOOKLET.

WILSON & CARPENTER of Mechanicsville, Iowa, carry a stock of Hardware, Stoves, Paint, Tinware, Pumps and Wire; conduct a tinshop, put in Furnaces and do plumbing. This spring the firm got out an attractive booklet, about 4½ x 6 inches in size, two pages


SALUTATORY.

After five and one-half years of growing and successful business, we deem it advisable to issue this circular catalogue as a reminder of the appreciation we feel for the business given us during this period and as an expression of gratitude to those who have assisted us in making the business what it is today.

We indulge the hope that this booklet will not only please you but will be of actual service to you in that it will indicate the variety of goods to be found in our store at all seasons of the year. We do not attempt to mention all the various articles handled by us.

The volume of business we have done and are doing is conclusive proof that we know what the people want and that we buy in quantities sufficiently large to insure our customers the best value for their money.

WELCOME!

Come and see us when in town. We have a good fire in winter and plenty water in summer and will be glad to see you whether you buy or not.

Wilson & Carpenter.

Fig. 1.—First Page of Booklet.

of which are reproduced in the accompanying cuts, reduced in size. By reference to Fig. 1 it will be gathered that this is the first attempt the firm have made to advertise in this manner. Fig. 2 conveys an idea of the attractive appearance of subsequent pages. The booklet is bound in tinted paper cover, and printed in two colors. It is "dedicated to our friends and patrons and those who ought to be." Two pages are devoted to a list of Hardware articles, arranged alphabetically. Among the

Carpenter Tools.

Saws,
Chisels,
Hammers,
Hatchets,
Planes,
Squares,
Bits, etc

Cattaraugus Brand.

Pocket Knives.
Shears,
Razors,
Butcher Knives,
Table Knives,
Carving Sets

FULLY WARRANTED.

Try the new Real Safety Razor.

Your Cistern will need water in the spring. See **Wilson & Carpenter.**

Fig. 2.—An Idea of the Style.

goods illustrated are Tea and Coffee Pots, Carpet Sweepers, Washing Machines, Meat and Vegetable Choppers, Stoves and Cherry Stoners. Many other lines are also mentioned. The firm have a regular mailing list, which they use for special advertising. The list has been compiled from the mailing list of a local newspaper, the firm's ledger, the county telephone list, &c.

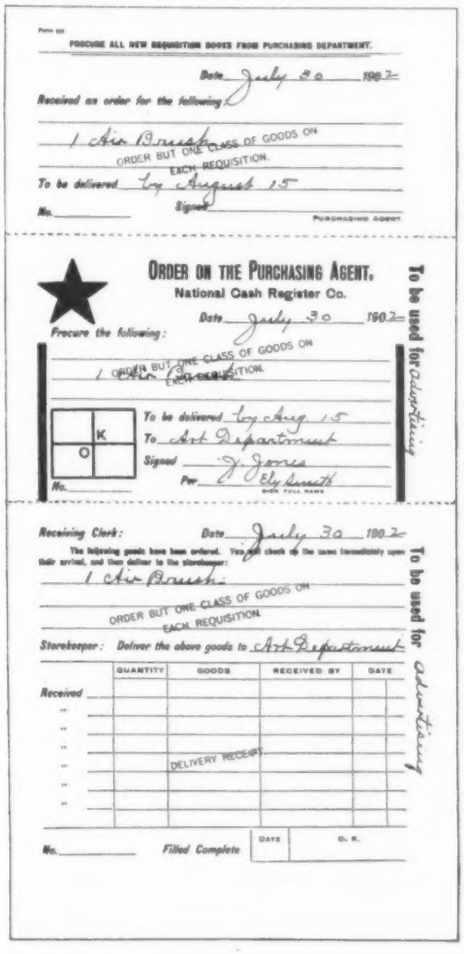
PURCHASING DEPARTMENT SYSTEM.

BY S E E.

THERE are presumably few engaged in manufacturing who are not interested in systems by which their plants may be run with a minimum amount of friction and cost. Among the best organized factories in the country is that of the National Cash Register Company, at Dayton, Ohio. The following will explain how a great variety and large quantity of goods, including all the supplies and material used in the company's works are obtained through the purchasing department by the use of requisitions.

Requisition Book.

In Fig. 1 is a reduced reproduction of a page of requisition book, showing the forms used and the method of filling out. The actual size of the page is 6 x 12 inches. The pages are bound in book, being secured at the top. The three parts, or slips, are divided by perforations, so that they may be easily detached. Each of the


PROCURE ALL NEW REQUISITION BOOKS FROM PURCHASING DEPARTMENT.

Date July 30 1902

Received an order for the following:

1 Air Brush

ORDER BUT ONE CLASS OF GOODS ON EACH REQUISITION.

To be delivered by August 15

No. Signed

PURCHASING AGENT

ORDER ON THE PURCHASING AGENT.

National Cash Register Co.

To be used for advertising

Date July 30 1902

Procure the following:

1 ORDER BUT ONE CLASS OF GOODS ON EACH REQUISITION.

To be delivered by Aug 15

To Art Department

Signed J. Jones

Per Ely Smith

No.

Receiving Clerk: Date July 30 1902

The following goods have been ordered. You will check up the same immediately upon their arrival, and then deliver to the storekeeper:

1 Air Brush

ORDER BUT ONE CLASS OF GOODS ON EACH REQUISITION.

Storekeeper: Deliver the above goods to Art Department

To be used for advertising

	QUANTITY	GOODS	RECEIVED BY	DATE
Received				
"				
"				
"		DELIVERY RECEIPT		
"				
"				

No. Filled Complete DATE O. K.

Fig. 1.—Page of Requisition Book—Actual Size, 6 x 12 Inches.

80 or 90 departments has a requisition book of this kind, so that a large number of books are in use all the time. On the cover of each book appears the name of the foreman and the department, also a set of rules similar to the following, which apply to all requisitions:

The following rules will be observed in ordering material of any description carried in stock, as per lists submitted some time ago by the Stock Department:

1. All requisitions must be made upon this form only, clear and distinct, otherwise they will not be acepted.

2. Requisitions must be signed by the head of a department or his authorized representative.

3. When the head of a department gives authority to some one in his department to sign his name to requisitions, a memorandum of such authority together with the signature of the authorized representative must be sent to the Stock Department. This is imperative.

4. In ordering raw material order but one class of goods on a requisition, and always give the use for which the material is intended.

5. Sheet brass should be ordered by gauge, steel by decimals, and Stub's and Crescent special drill rod by their respective gauges.

These rules particularly apply to orders for material from the stock department. On the inside of the cover of the book is a printed form to be used by the head of the department to give authority to some one in the department to sign requisitions in his absence. Both signatures appear.

Department Supervisor.

The requisition for an Air Brush having been entered on the "Order on the Purchasing Agent," the book goes first to the department supervisor. Each group of departments, such as art, printing and binding departments, coming naturally under advertising, the advertising agent is the supervisor over these departments. When the supervisor receives the book containing the requisition he investigates, and if he finds the article to be something really needed he sends the book with a communication to the Factory Committee, a body of five men who are in closest touch with the factory, asking them to O. K. the order, which they do if the article is considered necessary. An O. K. is only needed on special orders, as in the case of the Air Brush. If the requisition is favorably passed upon the book then goes to the

Store Department.

The person in charge of this department in turn puts his O. K. on the order, showing that there are no Air Brushes in stock. The book then goes to the requisition clerk in the

Purchasing Depa tment.

The clerk uses a numbering machine, which numbers the same four times and then changes, to number the three slips on the page of the requisition book, all receiving the same number. The fourth number is put upon an autograph register. Each department has its own number, and this number is placed opposite the requisition number on the autograph register. The clerk also stamps the three slips of the page, on the back, with a time stamp. He then receipts for the order on the top slip of the page, this remaining in the book for the future reference of the department giving the order, the art department in this case.

Autograph Register Slip.

Each day the numbers on the autograph register are torn off and pasted in a book and dated. These numbers are used in tracing lost requisitions, the way in which this is done being explained below. The second, or middle, slip on the page—the requisition—is retained in the purchasing department by which the goods are ordered.

The Order.

Orders for all goods are type written on regular letter heads having the words "Purchasing Department" prominent in red ink near the top. On the left-hand margin of the sheet, taking up a space about an inch in width, is the following notice printed in red:

Important Notice.

1. This order is complete when "Acknowledgment Slip" is returned to us filled out as requested.

2. In all cases this acknowledgment should be by return post.

3. Give date of shipment; also furnish immediately routing and car number.

4. Without fail, place our order number on invoice.

5. For immediate cash payment indicate discount on invoice.

6. Do not recognize any order unless given on this or our local form.

7. All goods herein ordered are subject to the approval of our inspector. Unless written orders are received to the contrary, all goods ordered by this company must be delivered at the office of the purchasing agent, that proper account may be taken of them.

8. The N. C. R. Company will not assume the payment of any bill for goods purchased unless delivery is made in compliance with the above rule, and also unless the party from whom purchase is made holds either regular or local form of order.

Across the bottom of the sheet the following request appears in red ink:

In every case where shipment is made us by freight, please see that bills of lading are sent us immediately.

At the bottom of the order is a detachable slip, which the firm receiving the order remove and fill it out with

their acknowledgment of the order, with promise of shipment. The slip is then mailed to the purchasing agent. Orders are made in triplicate by use of carbon sheets. The original, after being copied in the order book, which is an ordinary copy book, is sent to the firm from whom the goods are to be ordered. The number of the order is also placed on the top of the two carbon copies. The number of the requisition and also the number of the department are placed on the lower left hand corner of the original order. The order number is placed on the requisition, also the O. K. of the stenographer writing the order.

Carbon Copies of Orders.

Each morning the receiving clerk receipts in the order book for each carbon copy of the orders he receives, so that there may be no question as to which department goods received by him are to be delivered. The remaining carbon copy is taken in charge by the order clerk, whose duty it is to hurry up the delivery of goods until they are in the receiving department. A tickler is used to keep "rush orders" and promises regarding shipments of goods ordered, before the order clerk. Thus as each day of the month comes around it brings to his attention orders which should be investigated.

Receiving Clerk.

The lower slip on the page goes to the receiving clerk, who retains it permanently. He receipts for it on the bottom of each day's autograph number slip. So it will be seen that as the purchasing department does not order any goods except when a regular requisition is given the receiving clerk must always have his instructions, as shown on the lower slip of the page, relative to all goods ordered, as in the case of the Air Brush. He receives a copy of all invoices as they are received, from which he checks off the goods when they arrive. When the goods are received he refers to his file in which the slips are alphabetically filed under the subject, in this case, Brush, Air.

Distributing Goods.

He sends this slip with the Brush to the art department, through the store department, where it is charged. The art department receipts for the Brush and returns the slip to the receiving clerk, which he again files. When the goods have gone through the inspection department and the receiving clerk has recorded the same in the receiving book, of which he has charge, and obtained his receipt for the goods, he then turns into the purchasing department his carbon copy of the order, with a statement stamped on it to the effect that the or- was filled complete on such a date, that it passed inspection and that he holds a receipt for the same.

Order Scrap Book.

Scrap books are provided for pasting in the requisitions on the purchasing agent—the middle of the three slips—for future reference. Four spaces are allowed on each page for these slips. The spaces are consecutively numbered to correspond with the requisitions of the previous day. Those which have been attended to—*i. e.*, ordered, are pasted in the spaces corresponding with the number on the requisition. Requisitions for goods which cannot be ordered on the day they are received, are put on one of two hooks, marked "Written for Quotations" or "Investigate."

Keeping Requisitions in Sight.

Every few days the blank spaces left in the scrap book are investigated, the numbered blank spaces representing the number of the requisitions which should appear in the spaces. By referring to the numbers on the autograph number slips the department issuing the requisitions is known. In case a requisition is lost, which is seldom, the department is requested to issue a duplicate of such a number. If the requisition is found to be held for any reason, a notation to that effect is made upon the blank space in the book. In this way the requisitions are constantly kept in sight.

The Order Clerk's Cabinet.

A cabinet containing shelves is used for filing the carbon copies of orders in possession of the order clerk, as shown in Fig. 2. There are openings for each letter of the alphabet, each space being 8½ inches wide, 11 inches deep and 2 inches high. Carbon copies of all outgoing letters and telegrams are attached to the order clerk's carbon copy of the order to which they refer, as well as all letters and telegrams which are received relating to

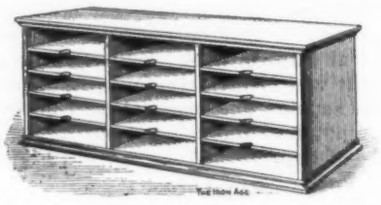


Fig. 2.—Order Clerk's Cabinet.

them. When the bill of lading is received the date and routing are placed on the order clerk's carbon copy of the order.

The Receiving Book.

All goods are entered in the receiving book, upon which the order clerk checks the goods received, as there may be some delay before the receiving clerk turns to his copy; or only a part of the order may have come in. The bookkeeping department also check their books from the receiving book. As contracts covering six months or so lead to a large amount of correspondence, they are dealt with separately, although in a similar manner. When an order is entirely filed it is filed, with all the papers attached, with the regular mail under the date it was filled. Thus at any time the history of any order can be looked up with little delay.

Other Requisitions

The reduced reproduction in Fig. 3 shows the form of blank used for ordering material from the store depart-

See other side of this sheet for instructions for properly filling out requisitions.

Weight_____ N. C. R. Co.

REQUISITION ON STOCK DEPARTMENT.

_____ 190__

Please deliver to_____

Quantity	MATERIAL	Pages

To be used for_____

Foreman_____

Per_____

Form No.36

Fig. 3.—Blank for Ordering Material.—Actual Size, 4¼ x 4½ Inches.

ment. The actual size of these blanks is 4¼ x 4½ inches, printed on white paper, and blocked. In Fig. 4 is shown a reduced reproduction of the requisition blank used for ordering stationery carried in stock. These are 4¼ x 5½ inches in size, printed on yellow paper and blocked.

Reading Room.

The company provide a free reading room and library for their employees, and there are consequently a large number of publications to look after.

Subscriptions to Publications

for the reading room are kept track of by the use of cards arranged in the case illustrated in Fig. 5. The division boards extending across the case slant from front to back, with about a ½-inch space between each board, in which the cards are placed. One opening is devoted to each publication, but in some instances there is more than one copy of a publication subscribed for, and in such cases there is a card to represent each copy. The cards are about 5 inches wide by 7 inches long with the

name of the publication and data relative to the subscription appearing at the top of each card, while below are spaces to check off the publication as it comes in. If any are not promptly received a letter is written to the publishers, a notation to that effect being made on the

Date _____ 190__
Ordered _____
SUPPLY DEPT. O. K.
Date received _____
REQUISITION ON SUPPLY DEPT.
Date _____ 190__
ITEMS
FOREMAN O. K.
Dept.
Signed _____
Received by _____ Date _____ 190__
Requisition blanks furnished by Supply Department.

Fig. 4.—Requisition Blank for Stationery—Actual Size, 4¼ x 5½ Inches.

card in the space provided. When the cards are placed in the case the names of the publications are always in view.

Delinquents.

In a conspicuous position in the purchasing department is a black board known as the "Red Board," upon which are recorded the names of firms and the kind of goods of all orders over three months old, which remain there until filled. These firms are not soon forgotten, and orders seldom go that way again, as three months is considered ample time in which to fill an order. The placing of orders is not governed entirely by the records on the board, but they are always taken into consideration. Perhaps the real good derived from the board is,

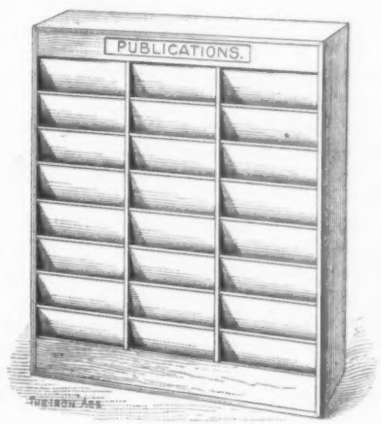


Fig. 5.—Card Case of Publications.

that it is in a place where traveling representatives may see it. It is not considered a good advertisement to have a well-known firm's name appear in such a role, where those seeing it may possibly drop a word or two here and there. It usually results in a firm trying to fill orders promptly rather than appear in the classification.

Quotations.

Quotations are kept on file by the card system, one step of which may be particularly mentioned, as it is somewhat original. The cards are perforated horizontally in the middle so as to be torn apart. The top part is in the form of a request for a quotation on any particular goods, in the required quantity, delivery, &c., being stated, with a notice that quotations to be recognized must be filled out on the lower portion of the card, which is to be signed and returned. The returned portions of the cards are filed in the manner usual in card systems. In this method the original quotation is always on file.

Samples.

The purchasing department has one room devoted almost entirely to samples received from different firms, carefully filed in large cabinets. In other cabinets samples of all material carried in stock are kept. The cabinets have sliding shelves to which the samples are fastened, as shown in Fig. 7. Each shelf has its label

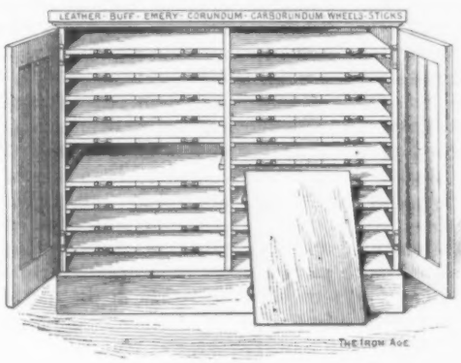


Fig. 6.—Cabinet for Samples.

as well as each cabinet, telling what is to be found in it. Each sample also bears a tag giving the data as to size, use, &c., which is of value when ordering goods. Doors close in front of the shelves.

Additional Checks.

Communications passing between different departments in the factory are filed in letter files by the department receiving them. Carbon copies are made of all communications sent from one department to another in the factory, upon which the department receiving the original puts its O. K. These are filed separate from the incoming communications, under the name of the material or article referred to. Everything is twice stamped, even the business cards which are presented. They are filed in a regular letter file and then cross indexed. Catalogues are filled and indexed with the card system.

From the foregoing it will be seen that everything is so filed and indexed that at a moment's notice hand can be laid on anything, resulting in a mimimum of friction and lowering the cost of carrying on the business.

EYE-CATCHING HEADLINES.

THE VONNEGUT HARDWARE COMPANY of Indianapolis, Ind., in one of their recent display newspaper advertisements used as an eye catching headline the words, "Spring Remedies." For "external use" they recommended Lawn Mowers, Garden Tools, Hose, Garbage Cans and Door and Window Screens. For "internal use" they enumerated Mops, Brooms, Brushes, Step Ladders, Carpet Sweepers, Tubs, Buckets and Pans. In another advertisement the head line, "Popular Summer Games," was used. The games mentioned included Freeze Out, Kitchen Comfort, Skeeter and Fly, and Physical Lawn Culture, and had reference to Refrigerators, Gasoline Stoves, Screen Doors and Windows, Lawn Mowers, in addition to Golf, Ping Pong and Lawn Tennis.

Blaine-Prewitt Hardware Company, Taylor and Weir, Texas, have been incorporated with a capital of $100,000. The incorporators are J. E. Tucker, James G. Blaine and Ira A. Prewitt of Taylor, and H. M. Finch and Stapley P. Finch of Austin. They will continue in the wholesale and retail Hardware, Agricultural Implement, Wagon and Buggy business, including also lumber, which is a recent addition to their line.

BRITISH LETTER.

The Week's Hardware Trade.

Offices of *The Iron Age*, HASTINGS HOUSE, NORFOLK ST., LONDON, W. C., May 30, 1903.

A SPELL of summer like weather has had a distinct influence for the better on the retail Hardware trade this week. Horticultural and Agricultural Appliances and Implements, such as Lawn Mowers, Syringes, Wire Netting and Tools and Machinery for the approaching hay harvest have made quite a spurt under the effect of bright sunshine and better spirits of buyers. House furnishing departments also report better business, and there has been a good call for such articles as Stove Screens, Carpet Sweepers, Canned Paints and other goods required by the housewife and house decorator for their annual spring cleaning. Generally, however, the retail Hardware trade is dull, which may be to some extent accounted for by the approach of the Whitsuntide holidays, though even these have brightened up sales of Trunks, Fishing Tackle, Cycles and so on.

Business in Hardware material is dull. From the Midlands it is reported that the Iron and Steel market is fairly steady. In the Lancashire district, however, the business position remains anything but satisfactory. For the most part buying still drags on in the slowest possible fashion, and although there is little actual quoted change in prices, the general tendency is toward weakness, with sellers of Pig Iron prepared to quote extremely low on forward sales. The fluctuation and gradual weakening in warrants prevents any confidence, and checks buying at all far ahead. Hematites also gradually weaken, and makers in some cases have had to follow the recent downward movement of the market by reductions.

Reports from Sheffield show that business continues quiet in the principal departments of the heavy section, while in the lighter departments of Cutlery, Silver Plating and Britannia Metal, only two of the larger houses are doing fairly well; the smaller establishments find business anything but satisfactory, and there seems no immediate prospect of improvement. According to a Sheffield correspondent the demand for hand made Files continues to slacken off and machinery is being more freely used every day. One of the large Steel houses in that city purchased some years ago the English rights of an American File Cutting Machine, which has been used ever since in their establishment. The firm in question have now 50 of these machines at work in eight sizes, which are made by themselves, owing to the patent having expired. Another Sheffield house has produced a rival to the File Stripping Machine now generally used. The new invention is said to be exceedingly simple, and yet most effective, doing the work of four practiced hands.

There is nothing of interest to report this week concerning either Hardware or material in Scotland or Wales.

Argentine Trade.

Rough Goods.—Iron goods: (*a*) In rough goods the principal articles imported by Argentina were Galvanized Wire from the United Kingdom, Galvanized Plain Wire from the United States of America and Germany, Bar and Sheet Iron from Belgium, Galvanized Sheets and Steel Rails from the United Kingdom, Iron Columns and Girders from Belgium and Germany and Steel Fish Plates from the United Kingdom.

Agricultural Machinery.—(*b*) In Agricultural Machinery the principal goods imported were Plows, Reaper Binders and all other implements to a lesser degree from the United States.

Other Manufactured Goods of Iron or Steel.—(*c*) In other manufactured goods of iron or steel the principal goods were Tools from the United Kingdom and the United States, railway material from the United Kingdom and Belgium, repairs for machines from the United States and the United Kingdom, and 16,000 Sewing Machines were imported and 500 Typewriters from the United States and Germany.

There is an excellent opening in Argentina for all appliances connected with or required in agriculture and grazing—Machinery, Tools, Harness, Seeds, Bags, Twine, Fencing Wire (Plain and Barb), Iron Posts and Droppers, Gates, Padlocks (insets), Cattle Brands, Scales, Wind Mill and other Pumps, Troughs, Pipes, Veterinaries' Instruments and Books, Sheath Knives, Sheet Iron and Enameled Ware. Probably the Canadian and Australian types would suit better than the British, and in taking up trade with the Argentine American exporters should bear this fact in mind. In a lesser degree, and for the million or so people who live in towns, are wanted, besides the usual necessities of life, Iron Pillars and Beams for house building, Baths and all kinds of up to date Sanitary Fittings, Electric Lifts, Lights and Bells, Floor and Wall Tiles, Water and Oil Paints and Wall Papers, Brick Making and Stone Working Machinery.

Rough Wood.—Wood, and articles of: (*a*) In rough wood the principal articles imported last year were pitch pine, spruce and white pine from the United States.

Wooden Articles.—(*b*) In wooden articles the principal imports were Automobiles, 24 from France and the United States; Carts from the United Kingdom, Furniture from Germany.

Raw Material.—Stones, earth and coal: (*a*) Raw Material. A long way ahead of everything in this department comes coal from Great Britain, and a long way behind Cement and Window Glass (500 sq. m.) from Belgium.

(*b*) Manufactured articles: The principal goods were China and Earthen Ware imported from Great Britain and Belgium, and Tiles, plain and glazed, from France.

Obstacles to Trade.

The difficulties in the way of trade with the Argentine are innumerable, but not insurmountable. They are difficulties only because they are different from American customs, due to law, climate, the cosmopolitan character of the people, the nature and extent of the country. When studied most of them vanish. The following are a few general characteristics worthy of study:

The regulations of the custom house.

The system of arbitrary valuation of those goods on which duty is charged ad valorem, and the various papers, stamps and formalities that are insisted upon before passing entries.

The varying discount on paper money.

The deliberate manner in which legal proceedings are carried on, due to the rule of reducing everything to writing and the heavy cost of employing good legal advice.

A new bankruptcy law has abolished the "moratorium" and all its attendant abuses.

The new law respecting the falsification of trademarks will restrict the mischief done to dealers in popular goods by unscrupulous falsifiers of bottles, marks and labels.

The innumerable formalities and delays in collecting money from creditors unwilling to pay, and the complications in the sale or purchase of many things, has given rise to the employment of brokers on a very large scale, each broker making more or less a specialty of some branch of business, becoming thoroughly acquainted with it and diminishing the possibility of subsequent claims on account of failure to comply with some formality.

Light Tools in South Africa.

Reference has been made in previous letters to the information gathered in South Africa concerning Hardware by W. B. Robertson, who went out at the close of the war as the special commissioner of one of our Hardware contemporaries. W. B. Robertson has the advantage of being a practical Hardwareman, and his opinions have been sought by commercial bodies in this country as to their prospects in the new colonies. He has just been lecturing before the Sheffield Chamber of Commerce and dealt more particularly with outlook for light tools, in which he considers Great Britain's chances are unsatisfactory. He states, however, that there is a decided tendency to revert to the productions of Sheffield in the matter of Files; and, provided these goods can be sup-

plied as cheaply as American made articles, Sheffield can confidently count on recapturing the trade. In "Lancashire" tools Germany does a larger share of the trade than is complimentary to British manufacturers, the German productions being as good as British and much cheaper. In Wood Working Tools, Saws and Planes, Axes and Carpenters' Hammers, America is far ahead. Farriers' Tools in use are mostly of American origin. He has frequently seen British tools made after American models, but the makers make a great mistake in trying to put them on the African market at a higher price than the articles they are intended to supplant. The colonial likes combination tools which are practical. Thus the Stanley Combination Planes have a considerable sale. For most Engineers' Tools Britain has still the best market, but certain attractive American specialties make their way on quality and appearance. Stocks and Dies are also coming from the United States. The strength, light weight, compactness and ease of inserting and extracting the Dies, and the ability to cut a whole thread at one run down are the points of excellence. Mr. Robertson states that to show samples to the export agents is useless. They must be exhibited in South Africa.

Triumph of American Wind Engines.

It has not been pleasant for makers of Wind Engines in this country to see the first prize of £50 offered some months ago by the Royal Agricultural Society carried off by an American firm. The prize has been awarded to the Goold-Shapley & Muir Company, Limited, of Brantford, Ontario, while the second prize of £20, which went to a Worcestershire firm, was the only consolation left to makers on this side. The trials commenced in March and were brought to a conclusion at the end of last month. In all 18 firms entered 22 Motors, several of the competitors being the agents on this side for American makers. I learn unofficially that the mills from your side have generally done well, and they will remain on the show ground until the end of the show, which takes place next month. As there is an ever widening field, not only in this country, but in the Colonies, for these mills for pumping and agricultural work, the growing demand should be carefully watched by American makers.

Embossed Metal Ceilings.

An important development is announced in connection with the South Wales tin plate trade, which will be of interest to American manufacturers of Embossed Metal Ceilings and Wall Linings. Patriotic industrial men in this country have for some time past cast envious eyes on the development of this trade in the United States, which has hitherto had a monopoly of the business of the world in this material. The matter has been revived by the following letter, which has been sent by one of our most prominent labor leaders—Ben Tillett—to the chairman and secretary respectively of the Welsh Plate and Steel Makers' Association:

I am instructed by the trade section of our union and the executive of the same to request a full meeting of the trade to discuss ways and means of extension or the creation of new products. We think the time has arrived when those most concerned in the trade should create new products; further, to increase the efficiency of machinery as well as labor. The suggestion on our part takes the form of introducing ornamental plates for the purpose of decoration, ceilings, walls, &c. We are of the opinion that a great field is open to the trade, especially in the building of hospitals, Government offices, warehouses, and such buildings are require, for the public health, to be built on the best sanitary principles.

Mr. Tillett goes on to remark that the importing into this country of ornamental sheets would reflect discredit upon the trade of this country, especially in the face of the fact that Wales is the home of the sheet trade. Meanwhile British architects and builders, I am informed, have awakened to the advantages of metal ceilings, and the demand for them is steadily growing. It will certainly be well for makers on your side to keep in touch with this market, for it will be some time yet before the Welsh manufacturers settle down to business, and it must not be forgotten that they have yet to gain the experience which is possessed by makers in the United States.

Automatic Time Recorders.

It has been the privilege of the writer during the past year to visit a large number of representative British engineering establishments. I have been particularly struck with the advances which have been recently made in appliances for automatic time recording. This is a branch in which America has a monopoly—in fact, British made machines in actual use represent a very small percentage of the whole. Four appliances appear to hold the field—the Bundy, Rochester, Dey and Simplex. Of these the Bundy, supplied by the International Time Recording Company of 171 Queen Victoria street, London, E. C., takes the lead, and the Rochester, imported by the same company, probably takes second place. As readers in the States will be aware, the Bundy instrument prints the hours of the arrival and departure of employees at the works on a continuous strip of paper ribbon, each employee having a key which prints his number and time as quickly as he can pass the machine. The Rochester, on the other hand, is more suitable where the card system of time and cost keeping is employed, a system which is coming into vogue with some of the more go ahead works, who are adopting a modification of the system employed by W. S. Rogers, general manager of the Bell Bearing Company of Boston. The Dey Time Register (an American instrument, but now made in this country by Howard Bros. of Liverpool), has the disadvantage that it will only record the time of a limited number of men—say from 1 to 50. The time slip is, however, neater than that given by the Bundy, and as each man's number occupies a separate line, the slips may be easily cut up and pasted in a time book. The other machine, the Simplex, imported by Plimptons of Liverpool and London, has the advantage of comparative cheapness as well as simplicity, and therefore appeals to small establishments. It is having a good run. There are, of course, other machines of British origin and make on the market, but they are generally clumsy and inaccurate. A very fine example of the Britisher's work finds a place in the museum of the International Time Recording Company. It was made by a Bristol firm and weighs about a quarter of a ton. A clock work arrangement revolves a circular tray with compartments in it, into which the brass checks are dropped through a slot. The man who arrives at 8 a.m. finds his check going into one compartment, while he who follows at 8-15 finds it dropped into the next one. British makers have improved since this atrocity was produced, but at present they are entirely out of the running. The Bundy instrument, by the way, is now being adopted by corporations for timing electric tram cars at certain points on the route. The conductor simply jumps off his car, inserts his key in the instrument (which may be fixed to a convenient lamp post) and goes on his way with only a delay of a second or two.

AUSTRALIAN NOTES.

MELBOURNE, May 2, 1903.

THE month just closed has been a shade better, as regards volume of business done, than its immediate predecessors. Heavy general rains marked its departure, but it is a long way to harvest time yet and we must not be hopeful too soon. The improvement in trade referred to is merely a "flash in the pan" and the winter will be quiet. Travelers' sheets are very light in comparison with years gone by. The drought lesson, to "pray less and dam more," will not be lost on us, and water conservation schemes and irrigation schemes will be features of future national policy.

Henry Meeks of the firm of Morris & Meeks, Melbourne, one of our leading Hardwaremen, was entertained at luncheon at the Vienna Café, Collins street, by the Victorian Hardware Association on April 28. The occasion was in celebration of Mr. Meeks having completed his fiftieth year in the State. He has served in every capacity in the Hardware Association during recent years, and in addition to his share in the control of his large wholesale Ironmongery business he is a prominent figure in the commercial world generally, taking an active

part in the directorate of other large businesses in other branches of trade. A sterling silver tea service was presented to Mr. Meeks, and in responding to the toast of his health he favored the company with a very interesting little sketch of his boyhood's difficulties, during what are now known as the "early days" of Victoria.

American manufacturers are specially asked to watch keenly for a large demand in sanitary appliances. The city of Brisbane, Queensland, with a population of 150,000, will be the next to discontinue the disgusting "pan" system. At present nothing is officially decided and the matter is in its very early stage of suggestion. There are many English makers carrying fair stocks out here, and ready to step in and quote at a moment's notice, both for cisterns and basins, as well as all tools and accessories. Possibly the septic tank system may be adopted in Brisbane, owing to the numerous hills presenting so many sewerage difficulties.

The city of Newcastle (N. S. W.) has also a sanitary scheme on hand, estimated to cost about £180,000, and this is being held temporarily in abeyance owing to shortness of funds. But the scheme is worthy of close attention from your sanitary fittings manufacturers.

The death of George Scarfe of the firm of Harris, Scarfe & Co., Limited, removes an interesting personality from Adelaide. His was an instance of a life devoted to his business, and his habits were so intensely regular that it is said the Adelaide people could always tell the exact time without reference to the clock when they saw Mr. Scarfe going to or from his office. Early to business and last away from it, it is said that for a quarter of a century or more he never missed a day's attendance. His end came after a brief illness of ten days. From small beginnings he built up a huge business, one of the largest in Australasia, and at the time of his death was largely interested in many profitable South Australian undertakings. His devotion to business precluded any share in public or political life, and he died in the middle of April at the ago of 76, reputedly worth £800,000.

The Victorian Hardware Assistants' Association held its first "smoke night" in the new club rooms, Melbourne, on the 1st inst. Melbourne possesses many musical voices among its Hardware assistants, and they were all in good form on this particular occasion. A fair sprinkling of employers were present, for the association has their full sympathy and co-operation.

The National Association of Master Plumbers of Australasia held its fourth annual convention in Brisbane during April. Delegates attended from the various States, and the convention was presided over by one of the best known of Melbourne plumbers, F. Atherton. Numerous papers were read on "Scientific Plumbing," "Hot Water Supply," "The Septic Tank System," and many other subjects of interest to plumbers.

REQUESTS FOR CATALOGUES, &c.

The trade are given an opportunity in this column to request from manufacturers price-lists, catalogues, quotations, &c., relating to general lines of goods.

REQUESTS *for catalogues, price-lists, quotations, &c., have been received from the following houses:*

From Harrington & Brown, who have succeeded F. B. Harrington in the Shelf and Heavy Hardware, Stove and Tinware, Paint and Oil, Sporting Goods and House Furnishing business at Elba, Neb.

From Nashwauk Hardware Company, Nashwauk, Minn., who have been incorporated with a capital stock of $10,000 to carry on a wholesale and retail business in Shelf and Heavy Hardware, Stoves, Tinware, Sporting Goods, Paints, Oils, &c.

From Memphis Hardware & Stove Company, Memphis, Tenn., in which are merged the interests of Vance Hardware Company of Chattanooga and Fox & McLendon Stove Company of Memphis. The officers of the new company are J. C. Vance, president; H. K. Vance, vice-president; Geo. S. Fox, secretary, and C. L. Harris, treasurer. The company will carry on the wholesale and retail business in Shelf and Heavy Hardware, Stoves and Tinware, Sporting and Athletic Goods, &c. They are putting in new adjustable shelving and display cases and are beautifying the store in every way possible. J. C. Vance, the president of the company, and Mr. Fox, secretary, are well known to the trade in the territory, having been identified with the sale of Hardware and Stoves for more than a generation.

From N. P. Barron, who has purchased the Hardware, Stove, Tinware, Paint and Oil and Sporting Goods business of W. B. Pilkington, Varina, Iowa.

From A. O. Mason, who has succeeded Grant City Lumber & Hardware Company, Grant City, Mo., dealers in Hardware, Stoves, Tinware, Agricultural Implements, Paints and Oils, Sporting Goods, Buggies, Lumber, &c.

From McLain & Griffin, Bonesteel, S. D., who have bought out T. J. Thompson & Co., dealers in Shelf and Heavy Hardware, Stoves, Tinware and Paints and Oils.

From J. K. Lacy, who has lately engaged in business under his own name at Newkirk, O. T., handling Shelf Hardware, Tinware, Stoves, Wagons, Buggies and Harness. Mr. Lacy was formerly secretary and treasurer of Drexel Mercantile Company, Drexel, Mo., and later secretary and general manager of Kay & Kaw Mercantile Company, Newkirk, O. T.

From Blanks Hardware Company, Lockhart, Texas, who have succeeded J. M. Blanks in the Farm Implement, Hardware, Buggy and Wagon business.

From Hullen & Pickett, Centralia, Mo., who are now conducting the business in Shelf and Heavy Hardware, Stoves and Tinware, Agricultural Implements and Sporting Goods formerly carried on by J. W. Hulen.

JENNISON HARDWARE COMPANY'S CATALOGUE.

THE JENNISON HARDWARE COMPANY, Bay City, Mich., have issued a fine bound catalogue of more than 650 pages, 7½ x 5 inches, including 38 pages of index, relating to their Mill, Mine, Vessel and Machinists' Supplies, Iron and Steel and Heavy Hardware. In compiling the catalogue the aim has been to condense as much as possible descriptive matter relating to the various articles, in order to present in compact form a large number of standard lists.

William S. Miller & Co. is the name of a new firm located at 113 Chambers street, New York, organized June 1, to deal in Shelf Hardware and Hardware Specialties and act as manufacturers' representatives. They expect to cover the entire United States. The head of the concern was formerly president of the Miller, Sears & Walling Company, jobbers of Hardware.

Crouch Hardware Company, Fort Worth, Texas, have been incorporated with a capital stock of $25,000, more than half of which has been paid up. The incorporators are J. P. Crouch and B. A. Bowers of McKinney; H. F. Schur of Dallas, and W. R. Francis and K. M. Watson of Fort Worth. Mr. Crouch is president; Mr. Francis, vice-president; Mr. Watson, secretary, and Mr. Bowers, treasurer. Mr. Crouch was formerly a member of the firm of Crouch-Saigling Company of McKinney, but disposed of his interest in January last. The company will transact a wholesale and retail business in Shelf Hardware, Stoves, Tinware and House Furnishing Goods, a specialty being made of Builders' Hardware and Mechanics' Tools.

CORBIN MOTOR VEHICLE COMPANY.

THE CORBIN MOTOR VEHICLE COMPANY were duly organized at the office of P. & F. Corbin, New Britain, Conn., on the 3d inst., with a capital of $200,000. The directors are P. Corbin, Howard S. Hart, Andrew J. Sloper, Charles Glover and Paul P. Wilcox of New Britain; Epaphroditus Peck and F. S. Manross of Bristol; Robert C. Mitchell of New York, and Charles M. Jarvis of Berlin. At a meeting of the directors the following officers were elected: President, P. Corbin; vice-president, Charles M. Jarvis; treasurer, Howard S. Hart; secretary and assistant treasurer, Paul P. Wilcox. It is the intention of the company to immediately begin the construction of Automobiles at the Russell & Erwin Mfg. Company plant of the American Hardware Corporation.

STAR SHOVEL & RANGE COMPANY.

THE plant of the Enterprise Stove Works at Vincennes, Ind., which was destroyed by fire a year ago, is being replaced by the Star Shovel & Range Company, composed of owners of the old Enterprise Works. The new factory building is of brick and fire proof construction, every precaution being taken to guard against fire. The plant is being equipped with a complete automatic sprinkling outfit, which includes a 20,000-gallon tank raised 20 feet above the highest point of the buildings. A gas producer plant is being installed to supply gas for the forges and furnaces, and for a 125 horse-power gas engine, which will operate an 80 kw. dynamo. Hydraulic elevators and side tracks to four railroad systems provide excellent facilities for handling and shipping goods. The company will manufacture Spades, Shovels, Steel Ranges, &c.

W. & J. TIEBOUT'S MARINE HARDWARE CATALOGUE.

W. & J. TIEBOUT, 118 Chambers street, New York, have just issued a cloth bound, illustrated catalogue of 225 pages devoted to Brass, Galvanized and Marine Hardware, the comprehensive character of which may be inferred from the fact that there are 32 columns of index. This house is a pioneer in the manufacture and sale of Ship Hardware, the business having been established in 1853 and incorporated in 1892. In the back of the book are shown many goods they have sold but never catalogued before.

WHITMAN & BARNES MFG. COMPANY'S NEW CATALOGUES.

THE WHITMAN & BARNES MFG. COMPANY, Chicago, Ill, and 111 Chambers street, New York, have issued two new catalogues of their products, both of which are alternately interleaved with quadrille ruled paper for notes and memoranda. Catalogue No. 55 contains 158 printed pages 9¼ x 6½ inches, illustrating large assortments of Parts, Repairs and Supplies for Agricultural Implements, Farmers', Blacksmiths' and Wagon Makers' Supplies; also Twist Drills, Wrenches, Spring Keys and Cotters, and many kinds of special molded and mechanical Rubber Goods. The other catalogue is of pocket size, for ready reference in machine shops, factories, &c., and covers Drills, Taps, Reamers, Arbors, Mandrels, Files, Hack Saws, Belting, Hose and many of the goods other than of an agricultural nature named above.

PRICE-LISTS, CIRCULARS, &c.

THE ROBIN HOOD POWDER COMPANY, Swanton, Vt.: Pamphlet entitled "Powder Facts." This contains facts and information regarding the company's Smokeless Powder and Loaded Ammunition. The company manufacture Smokeless Gun Powder, Shells and Loaded Ammunition.

THE HOUSER & HAINES MFG. COMPANY, Stockton, Cal.: Illustrated pamphlet descriptive of the Haines-Houser Combined Harvester. This is made in four models for 1903.

THE MICHIGAN STEEL BOAT COMPANY, Detroit, Mich.: Illustrated descriptive catalogue of Launches, Sail, Family, Livery, Duck, Fishing, Portable and Trunk Boats, all of Steel; also Aluminum Canoes. The company advise us that they have sold one jobber 1000 Boats to be taken before July 1, and that orders are being received from all parts of this country, as well as from Canada, Mexico and South America.

THE L. CLINE MFG. COMPANY, 1239 Wabash avenue, Chicago, Ill.: Catalogue illustrating a variety of goods, among which are Handy Wall Match Safes, Washing Machines, Roasting Pans, Shower Bath Yokes, Portable Shower Baths, Caster Cups, Tumbler and Tooth Brush Holders, &c.

J. H. WILLIAMS & Co., Brooklyn, N. Y.: Illustrated catalogue of Iron, Steel, Copper, Bronze and Aluminum Drop Forgings. The book has been carefully revised since the last edition, many sizes having been added to the old lists of standard Tools and a number of lines taken up. Among the latter are Hexagon Box Wrenches, Carriage Makers' Wrenches, Double Head Check Nut Wrenches, Milling Machine Dogs and Yoke Ends.

F. C. MASON & Co., St. Johns, Mich.: Illustrated catalogue devoted to Implement Supplies, showing a very complete line of Cultivator Points and Supplies of this character; also Harrow Teeth, Rake Teeth and Sections. Over 20 pages relate to Cultivator Points, the number, size and price of which are given. A large and varied line of Plow Bolts are also illustrated in a manner to be of service to the dealer in selecting such as cover his requirements.

THE YOST ELECTRIC MFG. COMPANY, Toledo, Ohio: Circular illustrating and describing the New Century Lawn Sprinkler. This has four revolving arms, mounted on a four-wheel base, so that it may be drawn about on the lawn.

THE W. J. CLARK COMPANY, Salem, Ohio: Illustrated pamphlet No. 24, illustrating the largest variety of Plate and Sheet Steel Specialties the company have ever catalogued. Included in these are Steel Tote Boxes, Pails, Kegs, Barrels, Hand Barrows, Joist or Timber Hangers, Post Caps and Bases, Elevator Buckets, Hose Couplings for air hose, &c.

THE BRIDGEPORT HARDWARE MFG. COMPANY, Bridgeport, Conn.: Illustrated catalogue devoted to Nail Pullers, Screw Drivers, Solid Steel Pliers, Cutters and Nippers, Ticket Punches, Can Openers, Nut Crackers, Hack Saws, Shears, Scissors, &c.

A. G. BELDEN & Co., 145 Maiden lane, New York: Catalogue containing letters from some leading manufacturers who have used Pycnoleum Belt Dressing, which is manufactured by them.

A. V. TAYLOR & Co., 1056 Central avenue, Cincinnati, Ohio: Catalogue and price-list relating to White Enameled Letters, Enameled Steel Signs, Gold Glass Letters and Figures, Advertising Sign Novelties, Enameled Door Plates and Labels, Trade-Marks and Emblems, Venetian Iron Swing and Drum Signs, &c.

THE STODDARD MFG. COMPANY, Dayton, Ohio: Catalogue relating to the Tiger Farm Implements, including Cultivators, Corn Planters and Drills, Hay Rakes and Tedders, Harrows, Plows, Grain Drills, Broadcast Seeders, Transplanters, &c.

THE KITSON HYDRO-CARBON HEATING & INCANDESCENT LIGHTING COMPANY, Philadelphia, Pa.: Catalogue devoted to the Kitson Incandescent System of Lighting, showing Cluster, Hood and Street Lamps of 2000 Candle-Power, Portable Contractors' Lamps, also a variety of Table, Bracket and Harp Fixture Lamps, together with Inside and Outside Arc Lamps.

THE DANA HARDWARE COMPANY, Boston, Mass.: Illustrated catalogue of more than 100 pages devoted to Guns, Rifles, Revolvers, Sporting Goods and Ammunition. This is the first catalogue issued by the company devoted to this line. While they have been handling Sporting Goods in a general way for many years, they have recently organized this branch as a separate department in charge of a competent man, and report largely increased sales.

THE WOODHOUSE CHAIN WORKS, Trenton, N. J.: Illustrated catalogue relating to Trace, Tug, Tailboard, Breast, Breeching, Back, Rein, Pole Chains, &c.; also Cow Ties.

THE TOKHEIM MFG. COMPANY, Cedar Rapids, Iowa: Catalogue illustrating the company's Self Measuring and Self Computing Oil Pumps. These are shown with basement and outside storage tanks, also with first floor tanks.

THE CONNECTICUT TOOL COMPANY, Bridgeport, Conn.: Adjustable Stocks and Dies for threading pipe. The company state that the Armstrong pattern Stocks and Dies manufactured by them are interchangeable with all other Stocks and Dies of this pattern. It is remarked that these goods are made of the best material suited to conditions necessary to turn out good tools, and that the goods are guaranteed. The company have just commenced manufacturing operations.

THE HARRINGTON CUTLERY COMPANY, Southbridge, Mass., successors to Dexter Harrington & Son: Illustrated price-list relating to Butcher Knives. These include Butcher, Steak, Sticking, Boning and Skinning Knives, also Cheese Knives. It is stated that all blades are ground sharp and honed.

THE NARRAGANSETT MACHINE COMPANY, Providence, R. I.: Catalogue R, devoted to Hand Screws, Clamps, Mallets, Handles, Chalk Line Reels, House Framers' Shoulder Chests, &c. The company are also manufacturers of Automatic Wood Turned Work of all kinds, and do Enameling on wood or iron in black, white or colors.

THE GENEVA CUTLERY COMPANY, Geneva, N. Y.: Illustrated folder and price-list devoted to Steel Laid Shears and Scissors, Razors and Cutlery Specialties.

THE LEATHER & BRASS MFG. COMPANY, Auburn, N. Y.: Catalogue No. 6 devoted to Belt Driven Air Compressors, Compound Automobile Pumps, Blowoff and Automatic Compression Valves, Pump Leathers, Frictionless Check Valves, Seamless Steel Tanks, Hand Air Pumps for drawing liquids, Bicycle Pumps, &c.

THE TRUSS & CABLE FENCE COMPANY, Cleveland, Ohio: Printed matter illustrating and describing the Truss and Cable Fence, showing uses to which it can be put.

THE UNION MFG. COMPANY, New Britain, Conn., and 103 Chambers street, New York: Catalogue No. 3, illustrating Union Planes, Iron and Wood Bottom Planes, Spoke Shaves, Circular Planes and the Union Adjustable Scraper, many of which are new with them. A feature of the book is the printing in parallel columns of prices in both dollars and sterling for the convenience of the foreign trade.

THE MERKLE MFG. COMPANY, Layton Park, Milwaukee, Wis.: 1903 catalogue of Motor Cycles and price-list of Motor Cycle parts, illustrating the growth and improvements made from the first design of the Merkel type, or "Embryo" machine, as it is called, up to the present time. In the 1903 model it has been the purpose of the company to eliminate all the bad points of previous designs, retain the good features and adopt still better ones. This machine is designed more for comfort than for speed, although it is claimed that a very fair speed can be maintained on good roads, and it is especially recommended for business use. The mechanism of the machine is said to be very simple and yet so put together as to insure durability under severe strains. A feature commending its use in the crowded streets of a large city is the ease with which it can be controlled, the adoption of a single lever contributing to this end.

THE WAGNER MFG. COMPANY, Sidney, Ohio: Illustrative, descriptive catalogue No. 12, relating to Cast Aluminum Ware, Aluminum Letters and Numbers, Nickel Plated Hollow Ware, polished inside and outside, High Grade Iron Ware, Stove Lid Lifters, Coal Grates, Gas Burners, Sugar Kettles, Ash and Furnace Doors, Boilers and Food Cookers, Lard Presses, Feed and Oil Troughs, Mauls, Tuyere Irons, Bob Sled Runners, Street and Gutter Crossings, Hitching Posts, &c. Special attention is directed to a line of Aluminum Tea and Table Spoons. Also to Aluminum Kitchen Spoons with hook, to prevent Spoon sliding into dish, and when used as a finger piece to prevent the Spoon turning while stirring batter, &c.

ACORN BRASS MFG. COMPANY, 51 North Peoria street, Chicago, Ill.: Illustrated catalogue of Western and Crescent Self Measuring Oil Pumps, with galvanized iron tanks. These goods are manufactured by the Western Oil Pump Company, St. Louis, Mo., and sold by the above company. The goods are shown in first floor, cellar and storage tanks, the Pumps of which work either by cable or link chain.

THE RICHMOND CEDAR WORKS, Richmond, Va.: Catalogue No. 16, devoted to Electric Hoop Tubs, Electric Hoop Pails, Covered Water Cans, Churns, Dry Measures, Army and Spice Pails, Ice Cream Pails and Tubs, Butter Dishes, Well Buckets, Toy Pails and Tubs, Candy Pails, Rotary Washing Machines, Kegs, Clothes Pins, Tree or Plant Tubs, &c. The illustrations are in colors.

CHATTANOOGA ROOFING & FOUNDRY COMPANY, formerly the Chattanooga Steel Roofing Company, Chattanooga, Tenn.: Illustrated catalogue for 1903, covering the varied and extensive line of Sheet Metal Products which they are now manufacturing. In an announcement to the trade at the beginning of the publication, the company state that they now own and conduct a large foundry, and have just added a galvanizing and nickel plating plant, which will greatly aid them in quickly getting out and perfectly finishing many of their products, notably the Moomaw Patent Sanitary Metal Shingles.

G. GENNERT, 24-36 East Thirteenth street, New York: Illustrated catalogue of Photographic Apparatus, including Lenses, Shutters, Cameras, Developing and Toning Accessories, &c.

THE TOLEDO METAL WHEEL COMPANY, Toledo, Ohio: Illustrated catalogue devoted to Wire Wheels, Velocipedes, Bicycles, Childrens' Wagons, Wheelbarrows, Buckboard Coasters, Doll Cabs, Sprinklers, &c.

THE GATE CITY FILTER COMPANY, 15 East Fourteenth street, New York: Revised illustrated price-list, May, 1903, of their Gate City Natural Stone Water Filters.

MISCELLANEOUS NOTES.

Roebuck's Screen Mixture.

The S. Roebuck Company, 172 Fulton street, New York, who have long manufactured window and door screens both for stock and to order at their Brooklyn factory, have put on the market a bottled liquid preparation for cleansing and preserving screen wire cloth of all kinds. In use the dust should be removed from the screen with a brush, applying the mixture with a cloth on both sides. The best results are obtained by using black or some kind of dark cloth.

Lineman's Hand Vise.

The Utica Drop Forge & Tool Company, represented by the Smith & Hemenway Company, 296 Broadway, New York, have put on the market a new telegraph or hand vise. This model is made with a loop by which to suspend it from the lineman's belt, and the jaws are closed or opened by means of a wing nut. The vise is made of selected steel, and has finely finished and tempered jaws.

Bulldog Chain Pipe Wrench.

The Trimont Mfg. Company, Roxbury, Mass., are making special efforts to introduce their Bulldog chain pipe wrench, which embodies several features peculiarly its own. One particular advantage claimed for this wrench is that the chain is held in a socket of the handle instead of by the usual method in jaws. For this reason the Bulldog wrench is said to be stronger, as the draw comes on the handle instead of on the jaws. The socket is so constructed that the chain will not drop out when the socket that holds the chain is on the under side.

Automatic Wind Mill Oiler.

The Red Cross Mfg. Company, Bluffton, Ind., are introducing to the trade an automatic wind mill oiler, upon

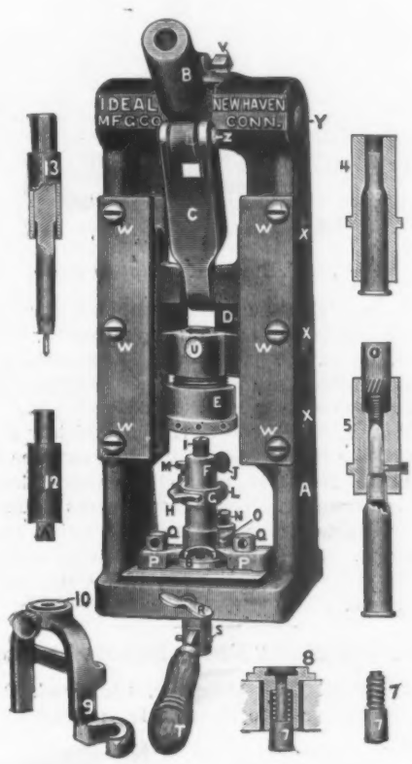
which they have just been granted United States and foreign patents. This device obviates the necessity of climbing high towers and the attendant dangers thereof. The mill is oiled from the ground, and it is stated that the proper amount of oil is distributed to each bearing of the wind mill with accuracy and economy. A specially prepared oil put up in 1-gallon wood jacketed cans is used, which will not congeal in the coldest weather, and is guaranteed to flow evenly. The device can be attached to any of the company's mills.

B. G. I. Special Tennis Racket

The Bridgeport Gun Implement Company, Bridgeport, Conn., and 313-317 Broadway, New York, have put on the market the B. G. I. special racket for tennis players, the distinguishing characteristic of which is the rattan cane reinforced shoulder, this method of construction enabling them to produce an exceedingly strong and finely balanced racket. Although the reinforcement enlarges the shoulder, it does not materially increase the weight of the racket, this particular pattern weighing about 14 ounces, equaling in strength rackets weighing 16 and 17 ounces not so reinforced. While the strength and driving power of the racket is increased, the tendency to break in the shoulder is overcome. This racket is offered as the most expensive tennis racket made in this country, retailing at $10 each, strung with a high quality of small gauge English gut especially for expert players, with large handle of combed black walnut or cedar.

The Ideal Loading Press.

The Ideal Mfg. Company, New Haven, Conn., are putting on the market the loading press shown herewith, designed for use by individuals, military companies and armory purposes, where unloading is done on an extensive scale. The permanent bench machine or press is referred to as larger and heavier than anything on the market, and as doing all that is required to properly reload shells that have been fired, decapping, recapping and opening the mouth of the shell, resizing the shell the whole length back to its original shape and size, sizing bullets, &c., and doing this in as large quantities as may be required in an easy and efficient manner. The press is about 11 inches in hight, and when packed in a case ready for shipment with a full set of tools weighs between 20 and 25 pounds. A rod 12 inches long fits in the hole in the top lever near the letter B. The various tools shown along the sides of the press are as follows: 4, Shell resizer; 5, double adjustable chamber; 7, recapper, punch and spring; 8, shell holder; 9, bullet sizing died holder; 10, bullet sizing die; 12, bullet sizing punch; 13, decapper and mouth opener.



The Ideal Loading Press.

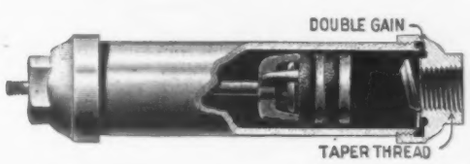
Savage Micrometer Wind Gauge Hunting and Target Sight No. 21.

The Savage Arms Company, Utica, N. Y., are putting on the market the micrometer sight herewith illustrated. It is constructed for use on Savage, Winchester, Marlin, Colt, Remington and all rifles having a rear slot in the barrel. The sight is furnished with straight top, without the buckhorns, if so desired. In use, to elevate or lower, the sight is pressed down at the horn end, which takes off the tension on the elevating screw, when the elevating screw is turned to any position required. For side adjustment the wind gauge screw is turned. If it is desired to set the sight permanently so that it cannot be adjusted by hand, the extra wind gauge set screw and extra elevating set screw are substituted for the regular wind gauge and elevating screws. These two set screws are immovable by hand, and have to be adjusted by screw driver and pin. The sight is also manufactured with these set screws instead of the regular screws. It is stated that the sight is scientifically designed, being the result of much practical shooting experience; that every part is well constructed of the finest materials, that it is strong and simple, that it can be adjusted in any direction to one thousandth of an inch, and has considerably more elevation than the regular buckhorn sights, and that all adjustments are obtained by finely threaded screws.

Savage Micrometer Wind Gauge Hunting and Target Sight No. 21.

Seamless Brass Pump Cylinder.

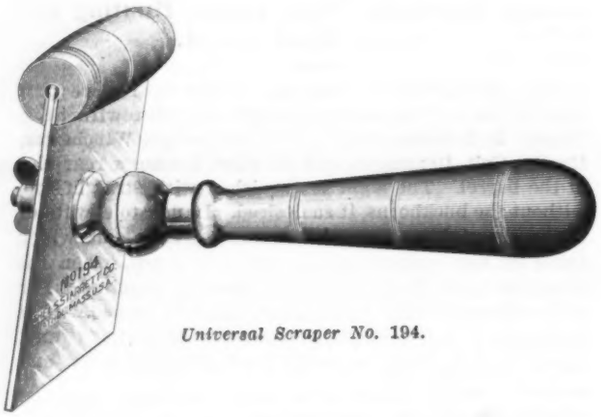
The Crestline Mfg. Company, Crestline, Ohio, are introducing the new seamless brass pump cylinder illustrated herewith. The principal features to which they call attention are that instead of cutting a straight thread for the pipe, a taper thread is adopted. Gains are also provided for the valve leathers, while thin cylinders are made from No. 11 gauge brass seamless tubing instead of No. 12. At a slight additional cost a new and improved form of valve is furnished for their cylinders, and instead of the usual four wings these valves are made with three wings. A rubber seat is supplied with all valves instead of leather. The same valve is used for both inside and outside cap cylinders, thus obviating the necessity of carrying two valves in stock.



Seamless Brass Pump Cylinder.

Universal Scraper No. 194.

The scraper illustrated herewith has all edges ground square, and by using both sides supplies eight sharp cutting edges, any one of which can quickly be brought into use by means of the ball joint connecting handle. By a slight turn of the handle the ball joint is frictionally locked or released, or placed at any angle desired to get into corners and to tip the scraper blade so as to give the



Universal Scraper No. 194.

most effective cut. The head piece, which may be instantly slipped off and on either end or side of the scraper, together with the handle, is referred to as enabling one to use it with a strong, firm grip, bearing on either heavily or lightly to effect the best results. It is designed for use on floors, benches, meat blocks, &c., and is being put on the market by the L. S. Starrett Company, Athol, Mass., New York store, 123 Liberty street.

The Arizona Bullion Truck.

The truck shown herewith is constructed of iron, steel and gas pipe throughout. Gas pipe handles are welded to solid bar iron extensions. The point is made that there is no wood to shrink or split, and no bolts to work loose as the parts are riveted together. The axle and wheels may be replaced when worn by withdrawing a cotter key, when a new pair of wheels or an axle can be substi-

The Arizona Bullion Truck.

tuted. With the truck in the position shown in the cut the front end is pushed under the keg of nails, ingot of copper or other article which it is desired to load, and the hook is held in position by the operator's foot until the truck is pulled over in a wheeling position. The hook then falls back with the point flush with the bed of the truck, and out of the way. The hook can be adapted to any class of heavy trucking where loads are uniform. The truck is 60 inches long, hight of bed 12 inches and width of handles 27 inches. It is offered by the Jackson Mfg. Company, Harrisburg, Pa.

The Turner Pressure Indicating Pump.

The pump herewith illustrated is manufactured by the Turner Brass Works, 48 Franklin street, Chicago. It is referred to as of special interest to manufacturers and owners of automobiles, the indicator provided showing

The Turner Pressure Indicating Pump.

accurately the air pressure obtained in filling rubber tires. The device also is adapted to pumping strong pressure in reservoirs, tanks, &c. The pump is provided with two 3½ x 5 inch cylinders, a pressure of 150 pounds capacity, a long detachable lever handle, and each pump is fitted with 10 feet of ¼-inch rubber tubing, which is alluded to as being of the best grade cloth. The extreme hight of the pump is 4 feet 4 inches and the weight booked for shipping is 30 pounds. The manufacturers claim that the device has double power and is double quick, as well as dual in action. The frame and lever handle are japanned finish, gold striped; the cylinder, gauge and fittings are polished nickel plate.

The Cleveland Knife Handle Husker.

The Cleveland Lock Company, Cleveland, Ohio, are offering the husker here shown. It is designed for use

The Cleveland Knife Handle Husker.

with bare hands or with mitts. It is pointed out that the husker has a full sized grip and that it does not cramp the hands. It is finished in japan and fitted with adjustable straps in assorted colors.

Current Hardware Prices.

REVISED JUNE 9, 1903.

General Goods.—In the following quotations General Goods—that is, those which are made by more than one manufacturer, are printed in *Italics*, and the prices named, unless otherwise stated, represent those current in the market as obtainable by the fair retail Hardware trade, whether from manufacturers or jobbers. Very small orders and broken packages often command higher prices, while lower prices are frequently given to larger buyers.

Special Goods.—Quotations printed in the ordinary type (Roman) relate to goods of particular manufacturers, who are responsible for their correctness. They usually represent the prices to the small trade, lower prices being obtainable by the fair retail trade, from manufacturers or jobbers.

Range of Prices.—A range of prices is indicated by means of the symbol @. Thus 33⅓@33⅓ & 10% signifies that the price of the goods in question ranges from 33⅓ per cent. discount to 33⅓ and 10 per cent. discount.

Names of Manufacturers.—For the names and addresses of manufacturers see the advertising columns and also THE IRON AGE DIRECTORY, issued April, 1902, which gives a classified list of the products of our advertisers and thus serves as a DIRECTORY of the Iron, Hardware and Machinery trades.

Standard Lists.—A new edition of "Standard Hardware Lists" has been issued and contains the list prices of many leading goods.

Additions and Corrections.—The trade are requested to suggest any improvements with a view to rendering these quotations as correct and as useful as possible to Retail Hardware Merchants.

Abrasives—

damite in Carloads:
Crystal ₱ ton $90@100
Grain ₱ ton $120@140
See also *Emery.*

Adjusters, Blind—

Domestic, ₱ doz. $3.00 33⅓%
North's 10%
Zimmerman's—See *Fasteners, Blind.*

Window Stop—

Ives' Patent 25&5%
Taplin's Perfection 25&5%

Ammunition—See *Caps, Cartridges, Shells, &c.*

Anvils—American—

Armand Hammer, Wrought ₱ lb 8½@8¾c
Buel Patent Trenton ₱ lb 9½@9¾c
Eagle Anvils ₱ lb 7¼@7¾c
Hay-Budden, Wrought 9@9¼c
Horseshoe brand, Wrought 9@9¼c

Imported—

Peter Wright & Sons ₱ lb 10½c

Anvil, Vise and Drill—

Milliers Falls Co., $18.00 50&10%

Apple Parers—See *Parers, Apple, &c.*

Aprons, Blacksmiths'—

Hull Bros. Co.:
Lots of 1 doz 25%
Smaller Lots 20%
Lots of 3 doz 30%

Augers and Bits—

Com. Double Spur 70&10@75%
Boring Machine Augers 66⅔@70%
Car Bits, 12-in. twist 60@60&10%
Jennings' Pattern
Auger Bits 50&10&5@60%
Ford's Auger and Car Bits 40%
Forstner Pat. Auger Bits 25%
C. E. Jennings & Co.:
No. 10 ext. lip, R. Jennings' list 25&10%
No. 30, R. Jennings' List 40&7½&10%
Russell Jennings 25&10&2½%
L'Hommedieu Car Bits 15&10%
Mayhew's Countersink Bits 45%
Millers' Falls 50&10&7½%
Pugh's Black 30%
Pugh's Jennings' Pattern 35%
Snell's Auger Bits 60%
Snell's Bell Hangers' Bits 50&10%
Snell's Car Bits, 12-in. twist 60%
Wright's Jennings Bits (R. Jennings' list) 50%

Bit Stock Drills—

See *Drills, Twist.*

Expansive Bits—

Clark's small, $15; large, $26 50&10%
Lavigne's Clark's Pattern, No. 1, ₱ doz., $26; No. 2, $18 50&10%
C. E. Jennings & Co., Steer's Pat. 25&10%
Swan's 60%

Gimlet Bits—

Common Double Cut gro. $2.50@3.00
German Pattern gro. $4.00@4.25

Hollow Augers—

Bonney Pattern, per doz. $11.00@11.50
Ames 25&10%
New Patent 25&10%
Universal 20%
Wood's Universal 25%

Ship Augers and Bits—

Ford's 40%
Snell's 40%
C. E. Jennings & Co.:
L'Hommedieu's 15&10%
Watrous' 33⅓&10%

Awl Hafts, See *Hafts, Awl.*

Awls—

Brad Awls:
Handled gro. $2.75@3.00
Unhandled, Shouldered gro. 63@66c
Unhandled, Patent gro. 66@70c
Peg Awls:
Unhandled, Patent gro. 31@34c
Unhandled, Shouldered gro. 65@70c
Scratch Awls:
Handled, Common gro. $3.50@4.00
Handled, Socket gro. $11.50@12.00
Hurwood 40%

Awl and Tool Sets—See *Sets, Awl and Tool.*

Axes—

First Quality, factory brands $5.50
First Quality, jobbers' brands $5.00@5.25
Second Quality $4.50@4.75

Axle Grease—See *Grease, Axle*

Axles—

Iron or Steel
Concord, Loose Collar 4¼@5c
Concord, Solid Collar 4¾@5¼c
No. 1 Common 3¾@4 c
No. 1 Com. New Style 3¾@4 c
No. 2 Solid Collar 4¼@4½c
Nos. 11 to 14 60c10c10@70%
Nos. 15 to 18 %
Nos. 19 to 22 70&10c5%
} Cash 10 days.

Boxes, Axle—

Common and Concord, not turned lb. 4¼@4½c
Common and Concord, turned lb. 5@5¼c
Half Patent lb. 9@9½c

Balances— Sash—

Caldwell new list 50%
Pullman's 60%

Spring—

Spring Balances 60@60&5%
Chatillon's:
Light Spg. Balances 40&10%
Straight Balances 40%
Circular Balances 50%
Large Dial 30%
Peiouze 50%

Barb Wire—See *Wire, Barb.*

Bars— Crow—

Steel Crowbars, 10 to 40 lb., per lb. 3@3½c

Towel—

No. 10 Ideal, Nickel Plate ₱ gro, $8.50
No. 20 Ideal, Brass Finish ₱ gro $8.50

Baskets—

Hoffman's Brick Baskets each $3.25

Beams, Scale—

Scale Beams, List Jan. 12, '85 40c10%
Chattillon's No. 1 30%
Chattillon's No. 2 40%

Beaters— Egg—

Lightning Chain, ₱ doz, $1.15; ₱ gro $12.00
National Mfg. Co.: ₱ gro.
No. 1 Dover, Family size $7.00
No. 2 Dover, Hotel size 14.00
Taplin Mfg. Co.: ₱ gro.
No. 69 Improved Dover $6.50
No. 75 Improved Dover $7.50
No. 75-2 Imp'd Dover, Tin'd $9.00
No. 100 Improved Dover $8.00
No. 102 Improved Dover, Tin'd $9.50
No. 150 Improved Dover, Hotel $15.00
No. 152 Imp'd Dover, Hotel, T'd $17.00
No. 200 Imp'd Dover Tumbler $9.00
No. 202, Imp'd Dover Tumbler, Tin'd $10.50
No. 300, Imp'd Dover Mammoth, ₱ doz $7.00
Wonder (S. S. & Co.) ₱ gro. $6.00

Bellows—

Blacksmith, Standard List 70@70&10%

Blacksmiths'—

Inch	30	32	34	36	38	40
Each	$3.50	3.75	4.25	4.80	5.35	6.15

Extra Length:
Each $4.00 4.55 5.10 5.60 6.40 7.50

Molders—

Inch	9	10	11	12	13
Doz	$8.00	9.50	10.90	12.80	14.25

Hand—

Inch	6	7	8	9	10
Doz	$4.75	5.70	6.60	7.60	8.50

} Net Prices.

Bells— Cow—

Ordinary goods 75c5@75&10%
High grade 70@70&10%
Jersey 75&10%
Texas Star 50%

Door—

Abbe's Gong 45%
Barton Gong 55%
Home, R. & E. Mfg. Co.'s 55&10%
Lever and Pull, Sargent's 60&10&10%
Yankee Gong 55%

Hand—

Hand Bells, Polished 60&5@60&10%
White Metal 55@55&10%
Nickel Plated 50@50&5%
Swiss 60@60&7½%
Cone's Globe Hand Bells 33⅓@33⅓&10%
Silver Chime 33⅓@33⅓&10%

Miscellaneous—

Farm Bells lb. 2@2¼c
Steel Alloy Church and School 60%
American Tube & Stamp'g Co. Gongs 70%
Trip Gong Bells 55&10@60%

Belting— Rubber—

Agricultural (Low Grade) 75&10@80%
Common Standard 75@75&10%
Standard 70@70&10%
Extra 60c10c5%
High Grade 59c10@59c10c5%
Boston Belting Co.:
Seamless Stitched Imperial 45&5%
Boston 50&5%
Niagara 60&5%

Leather—

Extra Heavy, Short Lap 60@60&5%
Regular Short Lap 60c10@60c10c10%
Standard 70@70c5%
Light Standard 70c10%
Cut Leather Lacing 60c10%
Leather Lacing Sides, per sq. ft 18c

Bench Stops—See *Stops, Bench*

Benders and Upsetters, Tire—

Detroit Perfected Tire Bender 40%
Green River Tire Benders and Upsetters 20%
Detroit Stoddard's Lightning Tire Upsetters, No. 1, $4.25; No. 2, $7.25; No. 3, $10.50; No. 4, $16.50; No. 5, $20.50.

Bicycle Goods—

John S. Leng's Son's 1902 list:
Chain 50%
Parts 50%
Spokes 50%
Tubes 60%

Bits—

Auger, Gimlet, Bit Stock Drills, &c.—See *Augers and Bits.*

Blocks— Tackle—

Common Wooden 70c10@75%
Hollow Steel Blocks, with Ford's Patent Sheaves 50&10%
Lane's Patent Automatic Lock and Junior 30%
Stowell's Novelty, Mal. Iron 50&10%
See also *Machines, Hoisting.*

Boards Stove—

Zinc, Crystal, &c. 30c10@40%

Bolts—

Carriage, Machine &c.—

Common, list Feb. 1, '02 60&10@60&10d 10%
Norway Iron. $3.00, list Jan. 1, '98 80@80&5%
Phila. Eagle, $3.00 list May 24, '99 80@80&5%
Bolt Ends. list Feb. 14, '95 65c5@..%
Machine, list Oct. 1, '99 65@..%
Machine with C & T. Nuts 60c2½@..%

NOTE.—*Jobbers are in many cases underselling the manufacturers.*

Door and Shutter—

Cast Iron Barrel, Round Brass Knob:

Inch	3	4	5	6	8
Per doz	$0.26	.30	.39	.47	.65

Cast Iron Spring Foot:

Inch	6	8	10
Per doz	$1.00	1.25	1.75

Cast Iron Chain, Flat, Japanned:

Inch	6	8	10
Per doz	$0.75	1.05	1.30

Cast Iron Shutter, Brass Knobs:

Inch	6	8	10
Per doz	$0.57	.80	1.00

Wrt Barrel, Jap'd 75c10@75&10c10%
Wrought " Bronzed 50c5@50&10%
Wrought Flush, B. K. 50c10@60&10%
Wrought Shutter 40c10c10@60c5%
Wrought Square Neck 50@50&10%
Wrought Sunk, Flush 50@50&10%
Ives' Patent Door 60%

Stove and Plow—

Plow 60@..%
Stove 30@30c10%

Tire—

Common 72½@72½&10%
Norway Iron 80@80&5%
American Screw Company:
Norway Phila., list Oct. 16, '84 80%
Eagle Phila., list Oct. 16, '84 82½%
Bay State, list Dec. 28, '99 72½%
Franklin Moore Co.:
Norway Phila., list Oct. 16, '84 80%
Eagle Phila., list Oct. 16, '84 82½%
Eclipse, list Dec. 28, '99 72½%
Russell, Burdsall & Ward Bolt & Nut Co.
Empire, list Dec. 28, '99 72½%
Norway Phila., list Oct. '84 80%
Upson Nut Co.:
Tire Bolts 72½%

Borers, Tap—

Borers Tap, Ring, with Handle:

Inch	1¼	1⅜	1¾	2
Per doz	$4.30	5.00	5.75	7.25
Inch			2¼	2½
Per Doz			$8.65	11.50

Enterprise Mfg. Co., No. 1, $1.35; No. 2, $1.65; No. 3, $2.50 each 25%

Boxes, Mitre—

C. E. Jennings & Co. 25&10%
Langdon 15&10%
Schatz 40%

Braces—

NOTE.—*Most Braces are sold at net prices.*
Common Ball, American $1.15@1.25
Barber's 50&10&10@60&10%
Fray's Genuine Spofford s 60%
Fray's No. 70 to 120, 81 to 123, 207 to 414 60%
C. E. Jennings & Co. 50&5&10%
Mayhew's Ratchet 60%
Mayhew's Quick Action Hay Patent 50%
Milliers Falls Drill Braces 25&10%
P., S. & W. Co. Peck's Patent 60&10@65%

Brackets—

Wrought Steel 75c10@80%
Bradley's Wire Shelf:
Full cases 80&10&10%
Broken cases 80&10%
Griffin's Pressed Steel 80%
Griffin's Folding Brackets 70&10%

Bright Wire Goods—See *Wire and Wire Goods.*

Broilers—

Wire Goods Co. 75@75&10%

Buckets, Well and Fire—

See *Pails*

Bucks Saw—

Hoosier ₱ gro. $36.00

Bull Rings—See *Rings, Bull.*

Butts— Brass—

Wrought list Sept., '96 30@30c5%
Cast Brass, Tiebout's 50%

Cast Iron—

Fast Joint, Broad 50@50c10%
Fast Joint, Narrow 50@50c10%
Loose Joint 70c5@70&10%
Loose Pin 70c5@70c10%
Mayer's Hinges 70&5@70c10%
Parliament Butts 70c5@70c10%

Wrought Steel—

Table and Back Flaps 75%
Narrow and Broad 75%
Inside Blind 75&10%
Loose Pin 75c10%
Loose Pin, Ball and Steeple Tip 60&5%
Japanned, Ball Tip Butts 70c10%
Bronzed Wrt. Nar. and Inside Blind Butts 55c10%
} Extra 10@10&10%

Cages, Bird—

Hendryx, Brass:
3000, 5000, 1100 series 5%
1200 series 33⅓%
200, 300, 600 and 900 series 40&10%
Hendryx Bronze:
700, 800 series 40&10%
Hendryx Enameled 40&10%

Calipers—See *Compasses.*

Calks, Toe and Heel—

Blunt, 1 prong per lb. 4@4¼c
Sharp, 1 prong per lb. 4¼@4½c
Perkins' Flint Toe ₱ lb 3½
Perkins' Sharp Toe ₱ lb 4

Cannons—

Breech Loading, 32 cal. Cartridge, Toy Cannons per doz. $2.00

Can Openers—See *Openers, Can*

Cans, Milk—

	5	8	10 gal.	
Illinois Pattern.	$1 50	2.00	2.25	each.
Iowa Pattern...	....	2.35	2.50	each.
	20	30	40	qts.
New York Patt'rn	1.65	2.40	2.75	each.
Baltimore Patt'rn	....	1.80	2.00	each.

Cans, Oil—

Buffalo Family Oil Cans:		
3	5	10 gal.
$48.00	60.00	120.00 gro

Caps—Percussion—

Eley's E. B......60c
G. D.....*per M* 32@34c
F. L.....*per M* 42@...c
G. E.....*per M* 47@50c
Musket.....*per M* 62@...c

Primers—

Berdan Primers, $1.00 per M.....5%
B. L Caps (Sturtevant Shells) $1.00 per M.....5%
All other primers per M. $1.22@$1.27

Cartridges—

Blank Cartridges:
32 C. F., $5.50.....10c&5%
38 C. F., $7 00.....10c&5%
22 cal. Rim, $1 50.....10c&5%
32 cal. Rim, $2.75.....10c&5%
B. B. Caps, Con., Ball Stock.....*$1 00*
B. B. Caps, Round Ball.....*$1.40*
Central Fire.....25%
Target and Sporting Rifle.....15c&5%
Primed Shells and Bullets.....15c&10%
Rim Fire Sporting.....50%
Rim Fire, Military.....15c&5%

Cases, Show—

Sun, No. 102, Silent Salesman, 6 ft., $25.00

Casters—

Bed.....70@70c&10%
Plate.....60@60c&5%
Philadelphia.....75@75c&10%
Boss.....70c&10%
Boss Anti-Friction.....70&10%
Martin's Patent (Phœnix).....45%
Standard Ball Bearing.....45%
Tucker's Patent low list.....30%

Cattle Leaders—

See *Leaders, Cattle.*

Chain, Coil—

American Coil, Jobbers' Shipments:

3-16	¼	5-16	⅜	7-16	½	9-16
8.50	6.40	4.90	4.00	3.80	3.70	3.65
⅝	¾	⅞	1 to 1¼ inch.			
3.60	3.55	3.50	3.40	per 100 lb.		

German Coil.....60 & 10c&10%

Halters and Ties—

Halter Chains.....60c&10@60c&10c&10%
German Halter Chains, list July 24, '97.....60c&10&10@70c&10%
Cow Ties.....60@60c&10%

Trace, Wagon, &c.—

Traces, Western Standard: 100 pair
6¼—6-3, Straight, with ring...$29.00
6½—6-2, Straight, with ring..$32.50
6½—8-2, Straight, with ring..$30.00
6½—10-2, Straight, with ring..$35.00
Add 2¢ per pair for Hooks.
Twist Traces 2¢ per pair higher than Straight Link.
Trace, Wagon and Fancy Chains..
.....60@60c&10%

Miscellaneous—

Jack Chain, list July 10, '93:
Iron.....60c&10@60c&10c&10%
Brass.....60c&10@60c&10c&10%
Safety Chain.....70c&10@75c&5%
Gal. Pump Chain.....lb. 4½@4¾c
Covert Mfg. Co.
Breast.....40&2%
Halter.....40&2%
Heel.....40&2%
Rein.....40&2%
Stallion.....40&2%
Covert Sad. Works:
Breast.....70%
Halter.....70%
Hold Back.....70%
Rein.....70%
Oneida Community:
Am. Coil and Halters.....40@45&5%
Am. Cow Ties.....45@50%
Eureka Coil and Halter.....45@50&5%
Niagara Coil and Halter.....45@50&5%
Niagara Cow Ties.....45&5@50&10&5%
Wire Dog Chains.....45@50&5%
Wire Goods Co.:
Dog Chain.....70&10%
Universal Dbl-Jointed Chain.....50%

Chalk—(From Jobbers.)

Carpenters' Blue.....gro. 40c
Carpenters', Red.....gro. 35c
Carpenters', White.....gro. 30c
See also Crayons.

Checks, Door—

Bardsley's.....40&10%
Columbia.....50&10%
Eclipse.....60%

Chests, Tool—

American Tool Chest Co.:
Boys' Chests, with Tools.....55%
Youths' Chests, with Tools.....40%
Gentlemens' Chests, with Tools.....30%
Farmers', Carpenters', etc., Chests, with Tools.....20%
Machinists' and Pipe Fitters' Chests, Empty.....30%
C. E. Jennings & Co.'s Machinists' Tool Chests.....33⅓&10%

Chisels—

Socket Framing and Firmer

Standard List.....70@70c&10%
Buck Bros.....30%
Charles Buck.....30%
C. E. Jennings & Co. Socket Firmer No. 10.....60&10%
C. E. Jennings & Co. Socket Framing No. 15.....60&10%
Swan's.....70%
L. & I. J. White.....30@30&5%

Tanged—

Tanged Firmers.....40c&5@40c&10%
Buck Bros.....30%
Charles Buck.....30%
C. E. Jennings & Co. Nos. 191, 181.....16⅔&10%
L. & I. J. White, Tanged.....25&2&5%

Cold—

Cold Chisels, good quality. lb. 13@15c
Cold Chisels, fair quality..lb. 11@12c
Cold Chisels, ordinary.....*lb. 8@9c*

Chucks—

Beach Pat., each $8.00.....35&5%
Pratt's Positive Drive.....25%
Empire.....25%
Blacksmiths'.....25%
Skinner Patent Chucks:
Combination Lathe Chucks.....40%
Drill Chucks, Patent and Standard..30%
Drill Chucks, New Model.....25%
Independent Lathe Chucks.....40%
Improved Planer Chucks.....25%
Universal Lathe Chucks.....40%
Face Plate Jaws.....40%
Standard Tool Co.:
Improved Drill Chuck.....45%
Union Mfg. Co.:
Combination.....40%
Gear Drill.....30%
Geared Scroll.....30%
Independent.....40%
Union Drill.....30%
Universal.....40%
Face Plate Jaws.....35%
Wescott Patent Chucks:
Lathe Chucks.....50%
Little Giant Auxiliary Drill.....40%
Little Giant Double Grip Drill.....40%
Little Giant Drill, Improved.....40%
Oneida Drill.....40%
Scroll Combination Lathe.....40%

Clamps—

Adjustable, Hammers'.....20@20&5%
Cabinet, Sargent's.....50&10%
Carriage Makers', P., S. & W. Co.....50%
Carriage Makers' Sargent's.....60%
Besly, Parallel.....33⅓&10%
Linemans, Utica Drop Forge & Tool Co.40%
Saw Clamps, see *Vises, Saw Filers'.*

Cleaners, Drain—

Iwan's Champion, Adjustable.....55%
Iwan's Champion, Stationary.....40%

Sidewalk—

Star Socket, All Steel....℔ doz. $4.05 net
Star Shank, All Steel....℔ doz. $3.24 net
W. & C. Shank, All steel, 7½ in. ℔ doz., $3.05; 8 in., $3.10; 8½ in., $3.25.

Cleavers, Butchers'—

Foster Bros.....30%
New Haven Edge Tool Co.'s.....45%
Fayette R. Plumb.....33⅓&33⅓&10%
P., S & W.....50@50&5%
L. & I. J. White.....30%

Clippers—

Chicago Flexible Shaft Company:
'93 Chicago Horse.....$8.75
1902 Chicago Horse.....$10.75
Lightning Belt.....$15.00
Chicago Belt.....$20.00
Stewart's Patent Sheep.....$18.50
} 25%

Clips Axle—

Eagle and Superior ¼ and 5-16 inch.....70c&10%
Norway, ½ and 5-16 inch..70@70c&10%

Cloth and Netting, Wire —See *Wire, &c.*

Cocks, Brass—

Hardware list:
Compression and Plain Bibbs.....65c&5@65c&10%
Globe, Kerosene, Racking, &c., Cocks.....65c&10@70%

Coffee Mills—See *Mills, Coffee.*

Collars Dog—

Brass, Walter B. Stevens & Son's list. 40%
Embossed, Gill, Walter B. Stevens & Son's list.....30&10%
Leather, Walter B. Stevens & Son's list 40%

Combs Mane and Tail—

Covert's Saddlery Works.....60&10%

Compasses Dividers, &c.

Ordinary Goods.....75@75c&5%
Bemis & Call Hdw. & Tool Co.:
Dividers.....65%
Calipers, Call's Patent Inside.....55%
Calipers, Double.....65%
Calipers, Inside or Outside.....65%
Calipers, Wing.....60%
Compasses.....50%
J. Stevens A. & T. Co.....25&10%

Compressors Corn Shock—

J. B. Hughes' ℔ doz.....$2.50

Conductor Pipe, Calva.—

L. C. L. to Dealers:

Territory.	*Nested.*	*Not nested.*
Eastern....	7 c&12½&5	70c&7½&5
Central.....	70c&7½&5	70&5
Southern...	65c&10&5	65c&5
S. Western..	65c&7½&5	65c&2½&5

Terms, 2% for cash. With delivery on fast crates.
See also *Eave Troughs.*

Coolers, Water—

Gal. each.	2	3	4	6	8
Labrador	$1.20	$1.50	$1.80	$2.10	2.70
Gal.	3	4	6	8	
Iceland, ea.	$1.80	$2.10	$2.40	$3.00	
Gal....	2	3	4	6	8
Galv. Lined Ea.	$1.85	$2.00	$2.25	$2.90	$3.90

25%

Ga.v. Lined side handles					
Gal.	2	3	4	6	3
Each.	$1.95	$2.15	$2.40	$3.3)	$4.15..25%

Coopers' Tools—

See *Tools, Coopers'.*

Cord— Sash—

Braided, Drab.....*lb. 25c*
Braided, White, Com.... *lb. 17½@18c*
Cable Laid Italian...*lb. A, 18c; B, 16c*
Common India.....*lb 9 @9½c*
Cotton Sash Cord, Twisted....*12@16c*
Patent Russia.....*lb. 12½@13c*
Cable Laid Russia.....*lb. 13½@14c*
India Hemp, Braided.....*lb 14@15c*
India Hemp, Twisted.....*lb. 10@12c*
Patent India, Twisted.....*lb.10@12c*
Anniston Cordage Co.:
Old Glory, Nos. 7 to 12.....℔ lb 24 ¢
Anniston, Nos. 7 to 12.....℔ lb 19 ¢
Old Colony, Nos. 7 to 12.....℔ lb 18½¢
Anniston Drab, Nos. to 12.....℔ lb 24 ¢
Pearl Braided, cotton.....℔ lb 17½¢
Massachusetts, White.....℔ lb 22½¢
Massachusetts, Drab.....℔ lb 26½¢
Eddystone Braided Cotton.....℔ lb 19¢
Harmony Cable Laid Italian.....℔ lb 18¢
Ossawan Mills:
Crown, Solid Braided White...℔ lb 22¢
Braided, Giant, White.....℔ lb 20¢
Peerless:
Cable Laid Italian.....16¢
Cable Laid Russian.....14¢
Cable Laid India.....12¢
Braided India.....18¢
Phœnix, White.....19¢
Samson, Nos. 7 to 12:
Braided, Drab Cotton.....℔ lb 32½¢
Braided, Italian Hemp.....℔ lb 32½¢
Braided, Linen.....℔ lb 49¢
Braided, White Cotton, Spot. ℔ lb 28½¢
No. 6 cords, 1¢ extra.
Silver Lake:
A quality, Drab, 40¢.....15%
A quality, White, 35¢.....15%
B quality, Drab, 35¢.....15%
B quality, White, 30¢.....15%
Italian Hemp, 40¢.....15%
Linen, 57½¢.....15%

Wire, Picture—

List Oct., '00.....85c&10@85c&10c&5%

Crackers, Nut—

Little Giant,.....℔ gr. $24.00

Cradles—

Grain.....50%

Crayons—

White Round Crayons, gross.5@5½c
Cases, 100 gro., $4.00, at factory.
D. M. Steward Mfg. Co.
Metal Workers' Crayons, gr. $2.50
Soapstone Pencils, round, flat or square.....gr. $1.50
Rolling Mill Crayons.....gr. $2.50
Railroad Crayons (composition) gr. $2.00
} Case lots 20%
See also *Chalk.*

Crooks, Shepherds'—

Fort Madison, Heavy.....℔ doz. $7.00
Fort Madison, Light.....℔ doz. $6.50

Crow Bars—See *Bars, Crow.*

Cultivators—

Victor Garden.....50%

Cutlery, Table—

International Silver Company:
No. 12 Medium Knives, 1847...℔ doz. $3.50
Star, Eagle, Rogers & Hamilton and Anchor.....℔ doz. $3.00
Wm. Rogers & Son.....℔ doz. $2 50
Simeon L. & Geo. H. Rogers Company:
12 dwt. Medium Knives.....℔ doz. $3.00)
No. 77 Medium Knives.....℔ doz. $2.50)

Cutters— Glass—

H. H. Mayhew Co.....40%
Red Devil.....50%
Smith & Hemenway Co.....50%
Woodward.....40%

Meat and Food—

Hale's..Nos. 11 & 111 12 & 112 13 & 113
Per doz... $8.00 10.75 14.50
American.....30%

Nos.	2	3	4	5
Each	$5	$7	$10	$25	$50	$60

Enterprise.....25@25&7½&5

Nos.	5	10	12	22	32
Each	$3	$3	$2.75	$4.50	$6

Dixon's, ℔ doz.....30&10@40%

Nos.	1	2	3	4
	$14.00	$17.00	$19.00	$30.00

Home No. 1, ℔ doz. $23.75.....50&10%
Little Giant, ℔ doz.....33⅓&5@40%

Nos.	305	310	312	340	322
	$35.00	$48.00	$44.00	$75.00	$68.00

N. E Food Choppers.....40%
Sterling.....40@40&1 %
No. 1 ....$2.00 each No. 2 ..$2.50 each
New Triumph No. 605, ℔ doz. $24.00.
.....30&10&10%
Woodruff's, ℔ doz.....30&10&40%

Nos.	100	150
	$15.00	$18.00

Enterprise Beef Shavers.....25@30%

Slaw and Kraut—

Henry Disston & Sons:
Slaw, Corn Grater, &c.....40%
Kraut Cutters 24 x 7, 26 x 8, 30 x 9.55%
Kraut Cutters 36 x 12, 40 x 12.....40%
Sterling, $6.00 each.....33⅓%
Tucker & Dorsey Mfg. Co.:
Kraut Cutters.....40%
Slaw Cutters, 1 Knife, ℔ gr....$18@$20
Slaw Cutters, 2 Knife, ℔ gr....$22@$36

Tobacco—

All Iron, Cheap.....*doz. $4.25@$4.50*
Enterprise.....25@50%
National, ℔ doz. No. 1, $21; No. 2, $18..40%
Sargent's, ℔ doz., No. 2.....60%
Sargent's No 12 and 21.....60&10%

Washer—

Appleton's, ℔ doz. $16.00.....50&10%
Bonney's.....40%

Diggers, Post Hole, &c.—

Dalbey Post Hole Auger...per doz., $9.00
Iwan's Improved Post Hole Auger.40&5%
Iwan's Vaughan Pattern Post Hole Augers, ℔ doz.....$6.75
Iwan's Perfection Post Hole Digger.. ℔ doz. $8.50
Iwan's Split Handle Post Hole Diggers. ℔ doz.....$7.50
Kohler's Universal.....℔ doz. $15.00
Kohler's Little Giant.....℔ doz. $12.60
Kohler's Hercules.....℔ doz. $10.00
Kohler's Invincible.....℔ doz. $9 60
Kohler's Rival.....℔ doz. $8.5)
Kohler's Pioneer.....℔ doz. $7.50
Never-Break Post Hole Diggers, ℔ doz. $24.00.....60%
Samson, ℔ doz. $34.00.....25%

Dividers—See *Compasses.*

Doors, Screen—

Phillips', style E, ⅞ in.....℔ doz, $10.50
Phillips', style 077, ⅞ in. .....℔ doz, $8.00
Phillips', style x-y, ⅞ in.....℔ doz, $11.00
Porter's Plain, No. 6.....℔ doz. $6 75
Porter's Ornamental, No. 70. ℔ doz. $10.50
Porter's No. 99.....$9.00
Porter's No. 44.....$10.75

Drawers, Money—

Sun Money Drawers, No. 5, ℔ doz. $9.50; No. 6, with Bell, $10.00; No. 6, with Gong, $10.50.
Tucker's Pat. Alarm Till No. 1, ℔ doz. $18; No. 2, $15; No. 3, $12; No. 4, $18.

Drawing Knives—

See *Knives, Drawing.*

Drills and Drill Stocks—

Common Blacksmiths' Drill..each $1.50@$1.75
Blacksmiths' Self-feeding. $3.75@4.00
Breast, Millers Falls.....15c&10%
Breast, P., S. & W.....40&5%
Goodell Automatic Drills..40&5@40&10%
Johnson's Automatic Drills Nos. 2 and 3.....10½&10%
Johnson's Drill Points.....16⅔&5&10%
Millers Falls Automatic Drills....33⅓&10%
Ratchet, Curtis & Curtis.....25%
Ratchet, Parker's.....40%
Ratchet, Weston's.....33⅓%
Ratchet, Whitney's, P. S. & W.....50%
Whitney's Hand Drill, No. 1, $10.00; Adjustable, No. 10, $12.00.....33⅓%

Twist Drills—

Bit Stock.....65c&10@60c&10c&10%
Taper and Straight Shank.....60c&10@60c&10c&5%

Drivers Screw—

Screw Driver Bits..per doz. ..45@75c
Baisey's Screw Holder and Driver, ℔ doz. 2½-inch, $6; 4-in., $7.50 6-in., $9..40%
Buck Bros.....30%
Buck Bros' Screw Driver Bits.....30%
Champion.....50%
Edson.....60%
Fray's Hol. H'dle Sets, No. 3, $12.00 50%
Gay's Double Action Ratchet.....35%
Goodell's Auto 50&10&10@50&10&10&5%
Hurwood.....40%
Mayhew's Black Handle.....50%
Mayhew's Monarch.....40&10%
Millers Falls, Nos. 2) and 21.....25&10%
Millers Falls, Nos. 11, 12, 41, 42.....15&10%
Never Turn.....60%
New England Specialty Co.....50%
Sargent & Co.'s:
Nos. 1.50, 55 and 60.....60%
Nos. 20 and 40.....70%
Smith & Hemenway Co .....40&5%
Stanley's R. & L. Co.'s:
No. 64, Varnished Handles 60&10&10%
No. 86.....70@70&10&10%
Swan's:
Nos. 65 to 68.....50%
No. 40.....40&10%
Nos. 25, 35 and 45.....20&10&10%

Eave Trough, Galvanized

Territory.	*L. C. L.*
Eastern.....	75c&10?&5%
Central.....	75c&12½%
Southern.....	75c&2½%
S. Western.....	75%

Terms, 2% for cash.
See also *Conductor Pipe and Elbows.*

Elbows and Shoes—

Factory shipments.....60%
Perfect Elbows (S. S. & Co.).....30%

Emery, Turkish—

	4 to 4½	5 to 5½	6 to 15	Flour
Kegs.....	*lb. 5c*	5½c	5½c	
½ Kegs.....	*lb. 5½c*	5¾c	5¾c	
Kegs.....	*lb 5c*	6c		
10-lb cans. 10 in case	6½	7c	6c	
10-lb. cans, less than 10		10c	10c	8c

NOTE.—*In lots 1 to 3 tons a discount of 10% is given.*

Extractors, Lemon Juice

Fasteners, Blind—See *Squeezers, Lemon.*

Zimmerman's.....50&10%
Walling's.....50%

Cord and Weight—

Ives.....40%

Faucets—

Cork Lined.....50@50c&10%
Metallic Key, Leather Lined.70@70c&10%
Red Cedar.....40c&10@50%
Petroleum.....70c&5@75%
P. & L. B. Co.:
Metal Key.....60&10%
Star.....60%
West Lock.....50&10%
John Sommer's Peerless Tin Key.... 40%
John Sommer's Boss Tin Key.....50%
John Sommer's Victor Metal Key.50&10%
John Sommer's Duplex Metal Key....60%
John Sommer's Diamond Lock.....40%
John Sommer's I. X. L. Cork Lined..50%
John Sommer's Reliable Cork Lined. 50&10%
John Sommer's Chicago Cork Lined..60%
John Sommer's O. K. Cork Lined.....50%
John Sommer's No Brand, Cedar.....50%
John Sommer's Perfection Cedar.....40%
McKenna, Brass:
Barglar Proof, N. P.....35%
Improved, ¼ and ⅜ inch.....35%
Self Measuring:
Enterprise, ℔ doz. $30.00..... .40&10%
Lane's, ℔ doz. $36.00.....40&10%
National Measuring, ℔ doz. $36..40&10%

Felloe Plates—

See *Plates, Felloe.*

Files—Domestic—

List revised Nov. 1, 1899.
Best Brands.....70c&5@70c&10c&5%
Standard Brands..75c&5@75c&10c&10%
Second Quality.....5c&10c&10@80c&5%

Imported—

Stubs' Tapers, Stubs' list, July 24, '97.....30%

Fixtures, Grindstone—

Net Prices:

Inch....	15	17	19	21	24
Per doz.	$2.60	2.75	3.00	3 50	4.40

P., S. & W. Co.....30&10@40%
Reading Hardware Co.....60%
Sargent's.....60&10&10%
Stowell's Giant Grindstone Hanger.... ℔ doz. $6.00
Stowell's Grindstone Fixtures, Extra Heavy.....50&10&10%
Stowell's Grindstone Fixtures Light... 60&10%

Fodder Squeezers—

See *Compressors.*

Forks—*Aug. 1, 1899, list.*

Hay, 2 tine 60%
Hay 3 tine ..... 60@7½%
Hay, 4 tine 60%
Hay, Header and Baler 3 tine ..... 60@15%
Hay, Header and Baler, 4 tine 60%
Grain or Barley 70%
Manure, 4 tine ..... 60@20%
Manure, 5 and 6 tine ..... 60@20%
Spading ..... 70@5%

Extra 10%

Iowa Dig-Easy Potato 65%
Victor, Hay 60%
Victor, Manure 60%
Victor, Header 60%
Champion, Hay 60%
Champion, Manure ..... 60@20%
Columbia, Hay 60%
Columbia, Manure 70%
Columbia, Spading ..... 70@10%
Hawkeye Wood Barley 4 tine ₱ dos. $5.00; 6 tine, $6.00.
W. & C. Potato Digger 65%
Acme Hay ..... 60@10@7½%
Acme Manure, 4 tine ..... 60@20@10%
Acme Manure, 6 tine ..... 60%@10@2%
Dakota Header ..... 65@15@5%
Jackson Steel Barley ..... 65@15@5%
Kansas Header 60%
W. & C. Favorite Wood Parley 4 tine, ₱ doz., $5.00; 6 tine, $6.00
Plated.—See *Spoons.*

Fountains, Stock—

Double Dewey ..... ₱ doz. $26.00

Frames—Saw—

Red, Polished and Varnished, doz. ..... *$1.15 @1.35*
White ..... *doz. 75@80*

Freezers Ice Cream—

Qts...	*2*	*3*	*4*	*6*	*8*	*10*
Best..	*$1.45*	*1.65*	*1.95*	*2.40*	*3.20*	*4.20*
Good	*$1.25*	*1.40*	*1.70*	*2.15*	*2.75*	*3.75*
Fair..	*$1.00*	*1.10*	*1.30*	*1.75*	*2.30*	*2.90*

Fruit and Jelly Presses—

See *Presses, Fruit and Jelly.*

Fry Pans—See *Pans, Fry.*

Fuse—*Per 1000 Feet.*

Hemp Fuse *$2.60*
Cotton Fuse *2.90*
Single Taped Fuse *3.25*
Double Taped Fuse *4.20*
Triple Taped Fuse *5.00*

10@5%

Gates, Molasses and Oil—

Stebbins' Pattern ..... *80@80@10%*

Gauges—

Marking, Mortise, &c. ..... *50@10@50@10@10%*

Chapin-Stephens Co.:
Marking, Mortise, etc. 50@10@50@10@10%
Scholl's Patent ..... 50@10@50@10@10%
Door Hangers ..... 50@50@10%
Fulton's Butt Gauge ..... 30@10%
Stanley R. & L. Co.'s Butt & Babbet Gauge ..... 20@20@10@10%
Wire, Brown & Sharpe's 25%
Wire, Morse's 25%
Wire P., S. & W. Co ..... 30@10%

Gimlets—Single Cut—

Nail, Metal, Assorted, gro. $1.40@1.60
Spike, Metal, Assorted gro. $2.80@3.25
Nail, Wood Handled, Assorted, gro. $1.75@2.00
Spike, Wood Handled, Assorted gro. $2.25@2.50

Glass, American Window

Jobbers' List, Dec. 16, 1902.
From store, Single and Double 90@10%
F. O. B. factory, carload lots:
Single and Double ..... *90@20@2½%*
2000 box lots ..... *90@25%*

Glasses, Level—

Chapin-Stephens Co. ..... 60@60@10@10@10%

Glue—Liquid, Fish—

List A, Bottles or Cans, with Brush. ..... *37½@50%*
List B, Cans (¼ pts., pts., qts) ..... *33⅓@48%*
List C, Cans (½ gal., gal.) ..... *25@45%*
International Glue Co. (Martin's) ..... 40@10@50%

Grease, Axle—

Common Grade ..... *gro. $5.00@6.00*
Dixon's Everlasting ..... 10-₱ pails, ea. 85¢
Dixon's Everlasting, in bxs., ₱ doz. 1 ₱ $1.20; 2 ₱ $2.00

Griddles, Soapstone—

Pike Mfg. Co. ..... 33⅓@33⅓@10%

Grindstones—

Bicycle Emery Grinder $6.50
Bicycle Grindstones, each ..... $2.50@3.00
Pike Mfg. Co:
Improved Family Grindstones, per inch, per doz. $2.00
Pike Mower Knife and Tool Grinder, each $3.00
33⅓%
Velox Ball Bearing, mounted, Angle Iron Frames ..... each, $3.25

Guards, Snow—

Cleveland Wire Spring Co.:
Galv. Steel ₱ 1000 ..... $9.00
Copper ₱ 1000 ..... $18.00

Halters and Ties—

Covert Mfg. Co.:
Web ..... 45&2%
Jute Rope ..... 40&5&2%
Sisal Rope ..... 20&2%
Covert's Saddlery Works:
Web and Leather Halters 70%
Jute and Manila Rope Halters 70%
Sisal Rope Halters ..... 60&20%
Jute, Manila and Cotton Rope Ties 70%
Sisal Rope Ties ..... 60&10%

Hammers—Handled Hammers—

Heller's Machinists' ..... 40&10@40&10&10%
Heller's Farriers ..... 40&10@40&10&10%
Magnetic Tack, Nos. 1, 2, 3, $1.25, $1.50, $1.75 ..... 40@40&10&10%
Peck, Stow & Wilcox 50%
Fayette R. Plumb:
Plumb, A. E. Nail. 33⅓&7½@33⅓&10&7½%
Engineers' and B. S. Hand ..... 50&7½&5@50&10&7½&5%
Machinists' Hammers 50&5@50&10&5%
Riveting and Tinners' ..... 40&2½@40&10&2½%
Sargent's C. S. New List 40%

Heavy Hammers and Sledges—

3 lb. and under...lb. 45c } *75@75*
3 to 5 lb.....lb. 30c } *@10%*
Over 5 lb.....lb. 30c }
Wilkinson's Smiths' ..... *9½c@10c lb.*

Handles—Agricultural Tool Handles—

Axe, Pick, &c. ..... *4@50@5%*
Hoe, Rake, &c. ..... *60@60@5%*
Fork, Shovel, Spade, &c.:
Long Handles *60%*
D Handles *50%*

Cross-Cut Saw Handles—

Atkins' ..... 40&5%
Champion ..... 45@45&10%
Disston's 50%

Mechanics' Tool Handles—

Auger, assorted ..... *gro. $2.30@$2.50*
Brad Awl ..... *gro. $1.25@$1.50*
Chisel Handles:
Apple Tanged Firmer, gro. ass'd, $2.25@$2.35; large, $2.50@$2.60.
Hickory Tanged Firmer, gro. ass'd, $1.75@$2.20; large, $3.50@$3.70.
Apple Socket Firmer, gro. ass'd, $1.70@$1.85; large, $2.60@$2.25
Hickory Socket Firmer, gro. ass'd, $1.60 @ $1.75; large, $1.75 @ $2.00
Hickory Socket Framing, gro. ass'd, $2.50@$2.75; large, $2.65@$2.85
File, assorted ..... *gro. $1.60@$1.15*
Hammer, Hatchet, Axe, &c. *50%*
Hand Saw, Varnished, doz. 70@75c
Not Varnished ..... *55@60c*
Plane Handles:
Jack, doz. 25c; Jack Bolted..55@60c
Fore, doz. 35@38c; Fore, Bolted.. 70@75c
Chapin-Stephens Co.:
Carving Tool ..... 40@40&10%
Chisel ..... 65@65&10%
File and Awl ..... 65@65&10%
Saw and Plane ..... 40@40&10%
Screw Driver ..... 40@40&10%
Millers Falls Adj. and Ratchet Auger Handles ..... 15&10%
Nicholson Simplicity File Handle, ₱ gro. ..... $0.35@$1.50

Hangers—

Barn Door, New Pattern, Round Groove, Regular:

Inch.....	*3*	*4*	*5*	*6*	*8*
Single Doz.	*$0.85*	*1.20*	*1.50*	*1.90*	*2.30*

Barn Door, New England Pattern, Check Back, Regular:

Inch	*3*	*4*	*5*	*6*
Single Doz.....	*$1.10*	*1.60*	*2.15*	*2.70*

Allith Mfg. Co.
Reliable ..... per doz. $15.00
Chicago Spring Butt Co.:
Friction 25%
Oscillating 25%
Big Twin 25%
Chisholm & Moore Mfg. Co.:
Baggage Car Door 50%
Elevator 40%
Railroad 55%
Cronk & Carrier Mfg. Co.:
Loose Axle 60%
Roller Bearing ..... 60&10%
Lane Bros. Co.:
Parlor, Ball Bearing $4.15
Parlor, Standard $3.75
Parlor, New Model $2.85
Parlor New Champion $2.25
Barn Door, Standard. 50&10&10&5%
Covered ..... 50&10&10%
Special ..... 50&10&10&5%
Lawrence Bros.:
Advance 60%
Cleveland ..... 60&10%
Crown 60%
Giant ..... 50&10%
New York 60%
Peerless ..... 60&10%
Sterling 60%
Swing, No. 95 ..... 50&10%
Union, No. 44, $5.00; No. 45 $7.00; No. 46, $9.00.
McKinney Mfg. Co.:
No. 1, Special, $15 ..... 60&10%
No. 2, Standard, $18 ..... 60&10%
Hinged Hangers, $16 ..... 50%
Meyers' Stayon Hangers. 50&10% (net)
C. S. Smith Mfg. Co.:
Lundy Parlor Door ..... 50&10%
Monarch Barn Door ..... 60&10%
Never Jump Hinge ..... 50&10%
Peerless ..... 60&10%
Perfection ..... 70&5%
Phœnix ..... 70&5%
Wagner's Adjustable ..... 70&10%
Warehouse Anti-Friction 60%
Richards Mfg. Co.:
Pioneer Wood Track No. 3 ..... $2.25
Imp'd Wood Track No. 5 ..... $2.25
Imp'd Steel Track No. 7 ..... $2.70
Imp'd Steel Track No. 7 ..... $2.65
Ball B'r'g Steel Track No. 9 ..... $2.50
Ball B'r'g Steel Track No. 10 ..... $2.50
Roller B'r'g Steel Track No. 11 ..... $2.45
Roller B'r'g Steel Track No. 12 ..... $2.40
Ball B'r'g Steel Track No. 18 ..... $2.75
Roller B'r'g Steel Track No. 14 ..... $2.65
Ball B'r'g Trolley Track No. 15 ..... 40%
Ball Brg Trolley Track No. 19 ..... 40&5%
Ball Bearing Tandem Trolley Track No. 16 ..... 40%
Silent Adjustable Track No. 18 ..... 40%
Auto Adjustable Track No. 22 ..... 40%
Trolley B. D. No. 17 ..... $1.60
Trolley F. D. No. 120 ..... $2.70
Trolley F. D. No. 121 ..... $2.85
Trolley F. D. No. 151 ..... $3.00
Roller Bearing D. D. No. 25 ..... 70&5
Roller Bearing U. S. B. D. ..... 70&5%
Anti Friction B. D. ..... 60&10%
Ives' Wood Track No. 1 ..... $2.15
Ives' Imp'd Wood Track No. 2 ..... $2.15
Stowell Mfg. and Foundry Co.:
Acme Parlor Ball Bearing 40%
Atlas 60%
Badger Barn Door 50%
Baggage Car Door 50%
Climax Anti-Friction 50%
Elevator 40%
Express 50%
Interstate 60%
Lundy Parlor Door 50%
Magic 50%
Matchless 60%
Nansen ..... 60&10%
Railroad 50%
Street Car Door 50%
Steel, Nos. 300, 404, 500 ..... 40&15%
Stowell Parlor Door 50%
Wild West, Nos. 300, 401, 500 ..... 50%
Zenith for Wood Track 50%
A. L. Swett Iron Works:
Eagle ..... 60&10%
Hylo ..... 50&10%
Perfection 60%
Pilot 60%
Taylor & Boggs Fy Co. 50&15&10&5%
Wilcox Mfg. Co.:
Bike Roller Bearing ..... 60&10%
C. J. Roller Bearing ..... 60&10%
Cycle Ball Bearing 50%
Dwarf Ball Bearing 40%
Ives, Wood Track ..... 60&10%
L. T. Roller Bearing ..... 60&10&5%
New Era Roller Bearing ..... 50&10%
O. K. Roller Bearing ..... 60&10&5%
Prindle, Wood Track 60%
Richards' Wood Track 60%
Richards' Steel Track ..... 50&10%
Spencer Roller Bearing ..... 60&10%
Tandem Nos. 1 and 2 ..... 60%
Underwriters' Roller Bearing 60%
Velvet 50%
Wilcox Auditorium Ball Bearing. 30%
Wilcox Barn Trolley No. 123 ..... 40%
Wilcox Elv. Door, Nos 112 and 122½. 50%
Wilcox Elv. Door, No. 132 ..... 40%
Wilcox Fire Trolley, Roller Bearing 30%
Wilcox Le Roy Noiseless Ball Bearing 40%
Wilcox New Century ..... 50&10&10%
Wilcox O. K. Steel Track 50%
Wilcox O. K. Trolley 50%
Wilcox Trolley Ball Bearing 40%
Wilcox Wilderman Narrow Gauge, Ball Bearing 40%
For Track, see *Rail.*

Extra 50@10% often given.

Hangers, Gate—

Myers' Patent Gate Hangers, ₱ doz., net, $4.50

Hasps—

McKinney's Perfect Hasp ₱ doz. 50%

Hatchets—

Best Brands ..... *50@50@10%*
Cheaper Brands ..... *60@60@10%*
Note.—Net prices often made.

Hinges—

Blind and Shutter Hinges—

Surface Gravity Locking Blind: (Victor; National; 1868 O. P. Niagara; Clark's O. P.; Clark's Tip; Buffalo.)

No.....	*1*	*3*	*5*
Doz. pair.....	*$0.85*	*1.75*	*3.50*

Mortise Shutter: (L. & P., O. S., Dixie, &c.)

No.....	*1*	*1½*	*2*	*2½*
Doz. pair....	*$0.70*	*.65*	*.60*	*.55*

Mortise Reversible Shutter, (Buffalo, &c.)

No.....	*1*	*1½*	*2*
Doz. pair....	*$0.75*	*.70*	*.65*

North's Automatic Blind Fixtures, No. 2, for Wood, $9.00; No. 3, for Brick, $11.50 ..... 10%
Parker ..... 70@75%
Reading's Gravity ..... 75&10%
Sargent's, Nos. 1, 3, 5, 11 & 13 ..... 70&10@70&20%
Stanley's Steel Gravity Blind Hinges, ₱ doz. sets, without screws, $9.80; with screws, $1.15.
Wrightsville H'dware Co.:
O. S. Lull & Porter ..... 7 &5%
Acme, Lull & Porter 75%
Queen City Reversible 75%
Stenger's Positive Locking, Nos. 1 & 3 ..... 70&10%
Shepard's Noiseless, Nos. 60, 65, 55 ..... 70&10%
Niagara, Gravity Locking, Nos. 1, 3 & 5 ..... 75%
1886, Old Pat'n, Nos. 1, 3 & 5 ..... 75%
Tip Pat'n, Nos. 1, 3 & 5 ..... 75%
Buffalo Gravity Locking, Nos. 1, 3 & 5 ..... 75%
Shepard's Double Locking, Nos. 20 & 25 ..... 70%
Champion Gravity Locking, No. 75. 75%
Steamboat Gravity Locking, No. 10. 75%
Pioneer, Nos. 060, 45 & 5½ 75%
Empire, Nos. 101 & 103 ..... 70%
W. H. Co.'s Mortise Gravity Locking, No. 2 ..... 60%

Gate Hinges—

Clark's or Shepard's—Doz. sets:

No.....	*1*	*2*	*3*
Hinges with Latches.	*$2.00*	*2.70*	*5.00*
Hinges only.....	*$1.40*	*2.05*	*3.80*
Latches only.....	*.70*	*.70*	*.35*

New England:
With Latch ..... *doz. ....@$2.50*
Without Latch ..... *doz. ....@$1.80*
Reversible Self-Closing:
With Latch ..... *doz. ....@$1.90*
Without Latch ..... *doz. ....@$1.55*
Western:
With Latch ..... *doz. $1.90*
Without Latch ..... *doz. $1.70*
Wrightsville H'dware Co.:
Shepard's or Clark's, doz. sets, No. 1 2 3

Hinges with Latches...	$2.00	2.70	5.00
Hinges only.....	1.40	2.05	3.80
Latches only.....	.70	.70	1.35

Spring Hinges—

Holdback, Cast Iron, gro. $9.50@10.50
Non-Holdback, Cast Iron gro $7@7.50
J. Bardsley
Bardsley's Patent Checking 15%
Bommer Bros.:
Bommer Ball Bring Floor Hinges 40%
Bommer Spring Hinges 40%
Chicago Spring Butt Co.:
Chicago Spring Hinges 25%
Triple End Spring Hinges 50%
Chicago (Ball Bearing) Floor Hinge 45%
Garden City Engine House 25%
Keene's Saloon Door 25%
Columbian Hdw. Co.:
Acme, Wrt. Steel 30%
Acme, Brass ..... 20&5%
American 30%
Columbia, No. 14 ..... ₱ gr. $9.00
Columbia, No. 18 ..... ₱ gr. $25.00
Columbia, Adjustable, No. 7, ₱ gr. $12.00
Gem, new list 30%
Clover Leaf ..... ₱ gr. $12.50
Oxford, new list 30%
Hoffman Hinge & Foundry Co.:
No. 70 & 80 Holdback Detachable $9.50
Lawson Mfg. Co.:
Machine 35%
Matchless Pivot 45%
Shelby Spring Hinge Co:
Crown Jamb Hinge 40%
Chief Ball Bearing Floor Hinge. 45%
Royal Ball Bearing Floor Hinge. 45%
The Stover Mfg. Co.:
Ideal, No. 16, Detachable, ₱ gr $12.50
Ideal, No. 4 ..... ₱ gr. $9.00
New Idea No. 1 ..... ₱ gr. $9.00
New Idea, Double Acting 45%

Extra 10% often given on most of these Hinges.

Wrought Iron Hinges—

Strap and T Hinges, &c., list Mar. 15, 1901:
Light Strap Hinges ..... *80@5%*
Heavy Strap Hinges *80@20@10%*
Light T Hinges ..... *75@10@5%*
Heavy T Hinges ..... *75@5%*
Extra Heavy T Hinges ..... *80@5%*
Hinge Hasps *70%*
Cor. Heavy Strap ..... *80@20@10%*
Cor. Ex. Heavy T ..... *80@20*

Extra 10@10%

Screw Hook and Strap. { *6 to 12 in.....lb. 3½c* / *14 to 20 in.....lb. 3¼c* / *22 to 36 in.....lb. 3 c*
Screw Hook and Eye:
¾ to 1 inch ..... *lb. 6 c*
⅝-inch ..... *lb. 7 c*
½-inch ..... *lb. 9 c*

Miscellaneous—

Hoffman's Steel Spring Butt Hinges ..... 40@10%
Hoffman's Offset Refrigerator Hinges ..... 40@10%

Hitchers, Stall—

Covert Mfg. Co., Stall Hitchers 35%

Hods, Coal—

	15	*16*	*17*	*18 inch.*
Galv. Open..	*$2.50*	*2.75*	*3.00*	*3.25* ₱ doz.
Jap. Open...	*$2.00*	*2.25*	*2.50*	*2.75* ₱ doz.
Galv. Funnel.	*$3.00*	*3.25*	*3.50*	*3.75* ₱ doz.
Jap. Funnel.	*$2.50*	*2.75*	*3.00*	*3.25* ₱ doz.

Masons, Etc.—

Cleveland Wire Spring Co.:
Steel Mortar ..... each $1.45
Steel Brick ..... each $1.10
Hoffman's:
Brick ..... each $1.10
Masons' ..... each $3.00
Plasterers' ..... each $3.20

Hoes—Eye—

Scovil and Oval Pattern ..... *60@10@60@10@10%*
Grub, list Feb. 23, 1899.... 70@70@10%

Handled—

Aug. 1, 1899, List:
Garden ..... *70@10%*
Meadow & Rhode Island *75@7½%*
Southern Meadow...75@5@2½%
Mortar and Street.....75@7½%
Planters', Regular Pat'n 70@30%
Cotton ..... *75@7½%*
Toy, Ladies', Boys', Onion, Turnip, Berry or Tobacco. 70@10@5%

Extra 20%

Note.—Manufacturers and jobbers use a diversity of lists, and often sell at net prices.
Ft. Madison Cotton Hoe ..... 75&7½%
Ft. Madison Crescent Cultivator Hoe, per doz ..... 75&10%
Ft. Madison Mattock Hoes:
Regular Weight ..... ₱ doz. $5.00
Junior Size ..... ₱ doz. $4.00
Ft. Madison Sprouting Hoe, ₱ doz. $4.60
Ft. Madison Dixie Tobacco Hoe. 75&20%
Kretsinger's Cut Easy ..... 70&10%
Warren Hoe 60%
W. & C. Ivanhoe ..... 75&2%
B. B. Cultivator Hoe ..... 75&10&2%
Acme Weeding ..... 75&10&2%
W. & C. Lightning Shuffle Hoe, ₱ doz. $4.85

Hoisting Apparatus—

See *Machines, Hoisting.*

Holders—Bit—

Angular, ₱ doz. $24.00 ..... 45&10%

Door—

Empire 50%

File and Tool—

Nicholson File Holders and File Handles 33⅓%

Hooks—Cast Iron—

Bird Cage, Reading 60%
Bird Cage, Sargent's List 60%
Ceiling, Sargent's List ..... 40&10%
Clothes Line, Hoffman's ..... 40&10%
Clothes Line, Reading List ..... 35&10@35&10&10%
Clothes Line, Sargent's List. 50&20&10%
Coat and Hat, Sargent's List ..... 45&10%
Clothes Line, Stowell's 70%
Coat and Hat, Stowell's 70%
Coat and Hat, Reading ..... 70@75%
Coat and Hat, Wrightsville 65%
Harness, Hoffman ..... per doz. 35@40¢
Harness, Reading List ..... 70&10@75%

Wire—

Belt *80%*
Wire C. & H. Hooks. 60@10@60@10@10%
Atlas, Coat and Hat:
Single Cases 50%
10 Case Lots ..... 50&10%
Czar Harness ..... 50&10&5%

Wire Coat and Hat:
Acme....60%
B. B....60%
V Brace, Chief and Czar....40%
Gem....60%
Bright Wire Goods—See *Wire.*

Wrought Iron—

Box, 6 in., per doz. $1.00; 8 in., $1.25; 10 in., $2.50.
Cotton....doz. $1.05@1.25
Wrought Staples, Hooks, &c.—
See *Wrought Goods.*

Miscellaneous—

Bush, Light, doz. $5.50; Medium, $6.00; Heavy, $6.50

Grass.....Nos.	1	2	3	4
Best.....	$1.50	1.75	2.00	
Common.....	$1.30	1.30	1.40	1.60

Potato and Manure....66⅔&20%
Whiffletree....lb. 5½c
Hooks and Eyes:
Brass....60&10&10@70%
Malleable Iron....70&5&70&10%
Covert Saddlery Works' Self Locking Gate and Door Hook....60%
Ft. Madison Cut-Easy Corn Hooks, ₱ doz. $5.25 net
Crown Picture....50&10%
Bench Hooks—See *Bench Stops.*
Corn Hooks—*See Knives, Corn.*

Horse Nails—See *Nails, Horse*

Horseshoes—

See *Shoes, Horse.*

Hose Rubber—

Garden Hose, ¾-inch:
Competition....ft. 4¼@ 4¾c
3-ply Standard....ft. 6 @ 6½c
4-ply Standard....ft. 7½@ 8 c
3-ply extra....ft. 8½@ 9 c
4-ply extra....ft. 10½@11 c
Cotton Garden, ¾-in., coupled:
Low Grade....ft. 6 @7 c
Fair quality....ft. 8 @9 c

Irons—

Sad—

From 4 to 10....lb 2¾@3c
B. B. Sad Irons....lb. 3@3¼c
Chinese Laundry....lb. 4¾@5c
Chinese Sad....lb. 3¾@4c
Mrs. Potts', per set:

Nos.....	50	55	60	65
Jap'd Tops....	71c	71c	81c	81c
Tin'd Tops....	77c	77c	87c	84c

New England Pressing, lb..3¼@3¾c

Pinking—

Pinking Irons....doz. 50@60c

Soldering—

Soldering Coppers 1½ and 3..21@22
1½ and 2....23@24c
Covert Mfg. Co....20&2%

Jacks, Wagon—

Covert Mfg. Co.:
Auto Screw....30&5%
Steel....45&2%
Covert's Saddlery Works':
Daisy....60&10%
Victor....60&10%
Lockport....50%
Lane's Steel....30&10%

Kettles—

Brass, Spun, Plain....20@25%
Enameled and Cast Iron—See *Ware, Hollow.*

Knives—

Butcher, Kitchen, &c.—

Foster Bros.' Butcher, &c....30%
Hartzell Cutlery Co....50%
Smith & Hemenway Co....40&10%
Hay and Straw—See *Hay Knives.*

Corn—

Withington Acme, ₱ doz., $2.65; Dent, $2.75; Adj. Serrated, $2.20; Serrated, $2.10; Yankee No. 1, $1.50; Yankee No. 2, $1.15.

Drawing—

Standard List....70&5@70&10%
Bradley's....
C. E. Jennings & Co. Nos. 45, 46, 60&10%
Jennings & Griffin Nos. 51, 52, 60&10&10%
Swan's....70&10&2½%
Watrous....16⅔&10%
L. & I. J. White....20&5@25%

Hay and Straw—

Lightning....₱ doz. $6.50@7.00
Iwan's Sickle Edge....₱ doz. $10.00
Iwan's Serrated....₱ doz. $10.00
Maine....₱ doz. $8.50

Mincing—

Buffalo....₱ gro. $13.00

Miscellaneous—

Farriers'....doz. $2.00@3.00
Wostenholm's....₱ doz. $3.00@3.25

Knobs—

Base, 2⅛-inch, Birch, or Maple, Rubber tip, gro....$1.10@1.20
Carriage, Jap, all sizes..gro. 25@30c
Door, Mineral....doz. 65@70c
Door, Por. Jap'd....doz. 70@75c
Door, Por. Nickel....doz. $2.05@2.15
Bardsley's Wood Door, Shutter, &c....15%
Picture, Sargent's....60&10%

Lacing Leather—

See *Belting Leather—*

Ladders Step Etc.—

Lane's Store....25%
Myers Noiseless Store Ladders....30%

Ladies— Melting—

L. & G. Mfg. Co....25%
P. S. & W....50%
Reading....60%
Sargent's....45&10%

Lanterns— Tubular—

Regular Tubular No. 0, doz. $4.35@4.75
Lift Tubular..No. 0, doz. $4.75@5.25
Hinge Tubular..No. 0, doz. $4.75@5.25
Other Styles....40c&10@40c&10c&5%

Bull's Eye Police—

No. 1, 2¾ inch....$2.50@2.75
No. 2, 3 inch....$2.75@3.00

Latches— Gate—

Hoffman's Safety Gate....₱ doz. 60c

Thumb—

Roggin's Latches, w. thscrew, dz 35@40c

Leaders. Cattle—

Small....doz. 55c; large, 60c
Covert Mfg. Co....45&2%

Lifters, Transom—

R. & E....33⅓%

Lines—

Wire Clothes, Nos...	18	19	20
100 feet....	$2.20	2.00	1.65
75 feet....	$1.80	1.70	1.30

Ossawan Mills.
Crown Solid Braided Chalk....33⅓%
Mason's, No. 0 to No. 5....33⅓%
Samson Cordage Works:
Solid Braided Chalk, No. 0 to 3....40%
Silver Lake Braided Chalk, No. 0, $6.00; No. 1, $6.50; No. 2, $7.00; No. 3, $7.50
₱ gr....30%
Anniston Waterproof Clothes, 50 lb., ₱ gro.: $22.00; Gilt Edge, $20.00; Air Line, $20.00; Acme, $15.00; Alabama, $15 00; Empire, $13.50; Advance, $13.50; Alliston, $11.50; Calhoun, $10.00; Oriole, $20.00; Albermarle, $25.50; Eclipse, $11.00; Chicago, $10.00; Standard, $9.00; Columbia, $8.00.

Locks— Cabinet—

Cabinet Locks....33⅓&35⅓&7½%

Door Locks, Latches, &c.—

[Net prices are very often made on these goods.]
Reading Hardware Co....50%
R. & E. Mfg. Co....40%
Sargent & Co....40@40&10%

Elevator—

Stowell's....40%

Padlocks—

Wrought Iron....7½&10&5@80&5%
R. & E. Mfg. Co. Wrt. Steel and Brass....75@75&10%

Sash, &c.—

Ives' Patent.:
Bronze and Brass....55&7½%
Crescent....50%
Iron....60&2½%
Wrought Bronze and Brass....50&5%
Wrought Steel....55%
Reading....60&10&10@70%

Machines— Boring—

Com., Upright, Without Augers...$2.00
Com., Angular, Without Augers, $2.25
Without Augers.

R. & E. Mfg. Co.:	Upright.	Angular.
Improved No. 3	$4.25	No. 1 $5.00
Improved No. 4	3.75	No. 2 3.38
Improved No. 5	2.75	
Jennings'...No. 4,	3.15	No. 1, 3.50
Millers' Falls.......		5.75
Snell's, Rice's Pat.	2.50	2.75

Hoisting—

Moore's Anti-Friction Differential Pulley Block....30%
Moore's Hand Hoist, with Lock Brake, 20%
Moore's Portable Pneumatic Hoist....25%

Ice Cutting—

Chandler's....15&10%

Washing—

Boss Washing Machine Co.:	Per doz.
Boss No. 1; Boss Rotary	$57.00
Boss No. 7; Dietz Rotary	$60.00
Champion Rotary; Banner No. 1	$54.00
Standard Champion No. 1	$48.00
Standard Perfection	$36.00
Cinti Square Western	$30.00
Uneeda American, Round	$29.00

Mallets—

Hickory....45&5@50%
Lignumvitæ....45&5@50%
Tinners', Hickory and Applewood, doz....50@55c

Mats— Door—

Elastic Steel (W. G. Co.)....10%

Mattocks—

See *Picks and Mattocks.*

Menders Hose

Robinson's Hose Menders....₱ gro, $2.00

Milk Cans—See *Cans, Milk*

Mills— Coffee, etc.—

Enterprise Mfg. Co....25@30%
Hoffman's Side, Coffee and Spice....
₱ doz. $1.25
National, list Jan. 1, '04....30%
Parker's Columbia & Victoria....50&10@60%
Parker's Box and Side....50&10@60%
Sun, No. 109, 1 ℔ mill....₱ doz, $3.00
Swift, Lane Bros Co....30%

Mowers, Lawn—

Net prices are generally quoted.
Cheap....all sizes. $1.90@1.95
Good....all sizes, $2.25@2.50

	10	12	14	16-inch
High Grade	4.25	4.50	4.75	5.00

Continental....60&10%
Great American....7
Great American Ball Bearing....60&10%
Quaker City....70%
Pennsylvania....60&10%
Pennsylvan a Ball Bearing....60&5%
Pennsylvania Golf....50%
Pennsylvania Horse....4
Pennsylvania Pony....45%
Philadelphia:
Styles M., S., C., K., T....70&10%
Style A, all Steel....60&10%
Style E, High Wheel....70&10&5%
Drexel and Gold Coin, low list...50&5%

Nails—

Cut and Wire. See Trade Report.
Wire Nails and Brads, Papered. List July 20, 1899....85&10c10@90%
Hungarian, Finishing, Upholsterers', &c. See Tacks.

Horse—

Nos.	6	7	8	9	10	
A. C.....	25c	23c	22c	21c	21c	40&5%
Ausable.....	28c	28c	25c	24c	23c	50&10%
C. B. K.....	25c	25c	22c	21c	21c	40%
Champ'n	28c	26c	25c	24c	23c	40&10&5%
Clinton.....	19c	17c	16c	15c	14c	30&10&5%
Maud S.....	25c	28c	22c	21c	21c	50%
Putnam.....	23c	21c	20c	19c	18c	33⅓%

Putnam
Cold Rol'd 19c 18c 17c 16c....10&10%
American, Nos. 5 to 10 ₱ ℔....9@9½c
Neponset....Nos. 5 to 10c ₱ ℔ 12c
Jobbers' special brands...per lb. 8@9c

Picture

	1½	2	2½	3	3½ in.
Brass Head..	.75	.80	.70	.95	1.00 gro.
Por. Head...	..	1.10	1.10	1.10	.. gro.

Crown Picture Nails....₱ gro. $1.50

Nippers, See *Pliers and Nippers.*

Nuts—

Cold Punched: *Off list.*
Mfrs. or U. S. Standard.
Square, plain....$4.50
Hexagon, plain....$4.60
Square, C. T. & R....$4.70
Hexagon, C. T. & R....$5.00
Hot Pressed:
Mfrs., U. S. or Nar. Gauge Stan'd.
Square Blank....$4.80
Hexagon Blank....$5.00
Square Tapped....$4.60
Hexagon Tapped....$4.80

Oakum—

Best or Government....lb. 6¼c
Navy....lb. 4¾c
U. S. Navy....lb. 5¼c
Plumbers' Spun Oakum....2¾c
In carload lots ¼c lb. off f. o. b. New York.

Oil Tanks—See *Tanks, Oil.*

Oilers—

Brass and Copper....65@65&10%
Tin or Steel....70&10@75%
Zinc....75@75&10%
Chase or Paragon:
Brass and Copper....60&10@65%
Tin or Steel....75@75&10%
Zinc....76@76&10%
Malleable, Hammers' Improved, No. 1, $3.60; No. 2, $4; No. 3, $4.40 ₱ doz. 20%
Malleable, Hammers' Old Pattern, same list....50&10%
American Tube & Stamping Co.:
Spring Bottom Cans....70&70&10%
Railroad Oilers etc....60&60&10%

Openers— Can—

French....doz. 35c
Iron Handle....doz. 25@27c
Sprague, Iron Hdle..per doz 35@40c
Sardine Scissors..doz. $1.75@3.00
Marvel....per doz. $1.25
National....50%
Stowell's....per doz. 35&45c
Tip Top....per doz. $0.75

Egg—

Nickel Plate....per doz., $2.25
Silver Plate....per doz., $3.50

Packing—

Asbestos Packing, Wick and Rope, 15@15½c lb.

Rubber—

Sheet, C. I....8@12c
Sheet, C. O. S....9@15c
Sheet, C. B. S....10@14c
Sheet, Pure Gum....60@70c
Sheet, Red....35@40c
Jenkins' Standard, ₱ ℔ 80c....25@25&5%

Miscellaneous—

American Packing....7@10c lb.
Cotton Packing....13@14c lb.
Italian Packing....9@12½c lb.
Jute....3½@4c lb.
Russia Packing....7@11c lb.

Pails— Creamery

S. S. & Co., with gauges.. No 1 $6.25; No. 2, $5.50 ₱ doz.

Galvanized—

Price per doz.

Quart.....	10	12	14
Water, Regular..	1.50	1.75	2.00
Water, Heavy....	2.75	3.00	3.25
Fire, Rd. Bottom.	2.50	2.60	2.80
Well....	2.25	2.50	2.75

Pans— Dripping—

Standard List....60@65&10&10%

Fry—

Common Lipped:

No.	1	2	3	4	5
Per doz.	$0.95	1.05	1.15	1.30	1.65

Roasting and Baking—

Regal, S. S. & Co., ₱ doz., Nos. 5, $4.50; 10 $5.25; 20 $5.75; 30, $6.25.
Simplex, ₱ doz.:

No.	40	50	60	140	150	160
	$2.75	3.25	3.75	3.00	3.25	4.00

Paper—Building Paper—

Asbestos: *lb.*
Building Felt....2¾c
Mill Board, sheet, 40 x 40 inches 3½c
Mill Board, roll, thicker than 1-16 inch....3¼c
Mill Board, roll, 1-16 in. thick and less....2½c
Per roll
Rosin Sized Sheathing: 500 sq. ft.
Light wt., 25 lbs. to roll..$0.43@0.50
Medium wt., 30 lbs. to roll..$0.48@0.55
Heavy wt., 40 lbs. to roll..$0.68@0.75
Black Water Proof Sheathing, 500 Sq ft., 1 ply, 65c; 2 ply, 85c; 3 ply, $1.10; 4 ply, $1.25.
Deafening Felt, 9, 6 and 4½ sq. ft. to lb., ton....$45.00
Red Rope Roofing, 250 sq. feet per roll....$1.65
NOTE.—*These goods are often sold at delivered prices.*

Tarred Paper.

1 ply (roll 400 sq. ft.), ton..$12.50@35.00
2 ply, roll 108 sq. ft....60@65c
3 ply, roll 108 sq. ft....82@87c
Slater's Felt (roll 500 sq. ft.)....75c
NOTE.—*Above prices often include delivery.*
R. R. M. Stone Surfaced Roofing (roll 110 sq. ft.)....$2.75

Sand and Emery—

Flint....60@60&10%
Garnet....25@20@15%

Parers— Apple—

Advance....₱ doz. $4.50
Baldwin....₱ doz. $5.00
Bonanza Improved....each $6.50
Dandy....each $7.50
Eureka, Improved....each $20.00
Family Bay State....₱ doz. $15.00
Improved Bay State....₱ doz. $36.00
New Lightning....₱ doz. $7.50
Reading 72....₱ doz. $4.00
Reading 78....₱ doz. $7.00
Turn Table '98....₱ doz. $6.75
White Mountain....₱ doz. $6.00

Potato—

Saratoga....₱ doz. $7.00
White Mountain....₱ doz. $6 00

Paris Green—

Less than 1 to.	*per lb.*
Arsenic kegs or casks....	*12½c*
Kegs, 100 to 175 lbs....	*13 c*
Kits, 14, 28, 56 lbs....	*14 c*
Paper boxes, 2 to 5 lbs....	*14 c*
Paper boxes, 1 lb....	*14½c*
Paper boxes, ½ lb....	*15 c*
Paper boxes, ¼ lb....	*16 c*

1 to 5 tons, 1 cent per lb. less; 5 tons and over, 1½ cents per lb. less.

Picks and Mattocks—

List Feb. 23, 1899....65&10@70%

Pinking Irons—

See *Irons, Pinking.*

Pins— Escutcheon—

Brass....60@60&10%
Iron, list Nov. 11, '85....60@60&10%

Pipe, Cast Iron Soil—

Standard, 2-6 in....50&10%
Extra Heavy, 2-6 in....65%
Fittings....70%

Pipe, Merchant,

Steel or Iron, Carload Lots,

Merchant Pipe.	*f.o.b. Pittsburgh. Black.*	*Galvanized.*
½, ¾, 1 inch....	68%	58%
1¼ inch....	70%	60%
1½ to 6 inch....	75%	65%
7 to 12 inch....	65%	50%

Less than carloads, 12½% advance.

Pipe Sewer—

Jobbers' Prices—
Standard Pipe and Fittings, 2 to 24 in.
New England....70%
New York and New Jersey....75%
Maryland, Delaware, East Penn. 75%
West Penn and West Va....76%
Virginia....78%
Ohio, Michigan and Ky....78%
Carload lots are generally delivered.

Pipe, Stove—

Edwards' Nested Stove Pipe:

	C. L.	L. C. L.
5 in., per 100 joints	$7.50	$8 50
6 in., per 100 joints	8.50	9.00
7 in., per 100 joints	9.00	10.00

Planes and Plane Irons—

Wood Planes—

Bench, First quality....40&5@40&10%
Bench, Second qual....60&5@60&10%
Molding....33⅓&5@33⅓&10%
Bailey's (Stanley R. & L. Co) 5&10@25&10&10%
Chapin-Stephens Co.:
Bench, First Quality....40@40&10%
Bench, Second Quality....50@50&10%
Molding....33⅓@33⅓&10%
Toy and German....40@40&10%
Gage Self Setting....35%
Union....60%

Iron Planes—

Bailey's (Stanley R. & L. Co)....25&10@25&10&10%
Chaplin's Iron Planes....50&10%
Miscellaneous Planes (Stanley R. & L. Co.)....20&10@20&10&10%
Sargent's....60%
Union....60%

Plane Irons—

Wood Bench Plane Irons....30&5@30&10%
Buck Bros....30%
Chapin-Stephens Co....30&30&10%
Stanley R. & L. Co...20&10@20&10&10%
L. & I. J. White....20&5@25%

Planters, Corn, Hand.

Kohler's Eclipse....₱ doz. $8.50

Plates—

Felloe....lb. 3½@4c
Self-Sealing Pie Plates (S. S. & Co.), ₱ doz. $2.00....50%

Pliers and Nippers—

Button Pliers....75@75&10%
Gas Burner, per doz., 5 in., $1.15@ $1.20; 6 in., $1.35@$1.45

Gas Pipe..	7	8	10	12-in.
	$1.75	$2.00	$2.75	$3.75

Acme Nippers....50&50&5%
Bernard's:
Parallel, Pliers....35%
Paragon Pliers....50&5%
Lodi Pliers....50&5%
Elm City Fence Pliers....35%
Cronk & Carrier Mfg. Co.:
American Button....75&10%
Cronk's....60%
Improved Button....70&10%
Stub's Pattern....50%
Combination and others....33⅓%
Heller's Farriers' Nippers, Pincers and Tools 40&10@40&10&10%
P., S. & W. Tinners' Cutting Nippers, 30@30&10%
Swedish Side, End and Diagonal Cutting Pliers....50%
Utica Drop Forge & Tool Co.:
Pliers and Nippers, all kinds....40%

Plumbs and Levels—

Chapin Stephens Co.:
Plumbs and Levels....30@30&10&10%
Chapin's Imp. Brass Cor....40@40&10&10%
Pocket Levels....30@30&10&10%
Level Glasses....60@60&10&10%
Disston's Plumbs and Levels....70%
Disston's Pocket Levels....70%
C. E. Jennings & Co.'s Iron....25&10%
C. E. Jennings & Co.'s Iron, Adjustable....33⅓&10%
Stanley R. & L. Co...30@30&10&10%

Stanley's Duplex.....20@20&10&10%
Woods' Extension.....33⅓%

Poachers, Egg—

Buffalo Steam Egg Poachers, ₱ doz., No. 1, $4.00; No. 2, $ .00; No. 3, $ .00; No. 4, $12.00.....50%

Points, Glaziers'—

Bulk and 1 lb. papers.. lb. 8¼c@..
½-lb. papers..... lb. 9¼c@..
¼-lb. papers..... lb. 9½c@..

Pokes, Animal—

Ft. Madison Hawkeye.....₱ doz. $3.25
Ft. Madison Western.....₱ doz. $4.00

Police Goods—

Manufacturers' Lists.....25@25&5%
Tower's.....25%

Polish—Metal—

Prestoline Liquid, No. 1 (½ pt.), ₱ doz. $3.00; No. 2 (1 qt.), $9.72.....40%
Prestoline Paste.....40&10%
George William Hoffman:
U. S. Metal Polish Paste, 3 oz. boxes, ₱ doz. 50¢; ₱ gr. $4.50; ½ lb boxes, ₱ doz. $1.25; 1 lb boxes, ₱ doz. $2.25.
U. S. Liquid, 8 oz. cans, ₱ doz. $1.25; ₱ gr. $12.00.
Barkeepers' Friend Metal Polish, ₱ doz. $1.75; ₱ gr. $18.00.
Wynn's White Silk, ¼ pt. cans, ₱ doz.....$2.00

Stove—

Black Eagle Benzine Paste, 5 lb cans.. ₱ lb 10¢
Black Eagle, Liquid, ½ pt. cans ₱ doz. 75¢
Black Jack Paste, ¾ lb cans, ₱ gro. $9.00
Ladd's Black Beauty, gr. $10.00.....50%
Joseph Dixon's, ₱ gr. $5.75.....10%
Dixon's Plumbago.....₱ lb 8¢
Fireside.....₱ gr. $2.50
Gem, ₱ gr. $4.50.....10%
Japanese.....₱ gr. $3.50
Jet Black.....₱ gr. $3.50
Peerless Iron Enamel, ½ pt. cans..... ₱ doz. $1.50
Wynn's:
Black Silk, 5 lb pail.....each 70¢
Black Silk, ½ lb box.....₱ doz. $1.00
Black Silk, 5 oz. box.....₱ doz. $0.75
Black Silk, ½ pt. liq.....₱ doz. $1.00

Poppers, Corn—

1 qt., Square.....gro. $9.00
1 qt., Round.....gro. $10.00
1½ qt. Square.....gro. 11.00
2 qt., Square.....gro. 13.00

Post Hole and Tree Augers and Diggers—

See also *Diggers, Post Hole, &c.*

Posts, Steel—

Steel Fence Posts, each, 5 ft., 42¢; 6 ft., 46¢; 6½ ft., 48¢.
Steel Hitching Posts, each.....$1.30

Potato Parers—

See *Parers, Potato.*

Pots— Glue—

Enameled.....40%
Tinned.....35%

Powder—

In Canisters:
Duck, 1 lb. each.....45c
Fine Sporting, 1 lb. each.....75c
Rifle, ½-lb. each.....15c
Rifle, 1-lb. each.....25c
King's Semi-Smokeless:
Keg (25 lb bulk).....$6 50
Half Keg (12½ lb bulk).....$3.50
Quarter Keg (6¼ lb bulk).....$1.90
Case 24 (1 lb cans bulk).....$8.50
Half case (1 lb cans bulk).....$4 50

King's Smokeless:	Shot Gun	Rifle
Keg (25 lb bulk).....	$12 00	$13.00
Half Keg (12½ lb bulk)	6.25	7.75
Quarter Keg (6¼ lb bulk)	3.25	4.00
Case 24 (1 lb cans bulk)..	14.00	17 00
Half case 12 (1 lb cans blk)	7.25	8 75

Robin Hood Shot Gun.....50&20%

Presses—Fruit and Jelly—

Enterprise Mfg. Co.....30@25%
Sensible.....30&5%
2 qt., $2.00; 4 qt., $4.00; 10 qt., $6.00 each.

Seal Presses—

Morrill's No. 1, per doz. $20.00.....50%
Morrill's No. 2, per doz. $22 50.....50%

Pruning Hooks and Shears—See *Shears.*

Pullers Nail—

Cyclops.....50%
Miller's Falls, No. 3, per doz. $12.00..... 33⅓&10%
Pearson No. 1, Cyclone Spike Puller, each $37.50.....50%
Pelican, ₱ doz. $9.00.....40&10%
Scranton, Case Lots:
No. 1 (large), ₱ doz. $4.50; No. 2 (large), $5.75; No. 3 (small), $5.00; No. 2-B (large), $5.50; No. 3-B (small), $5.00; No. 2-D (large), $4 50; No. 3-D (small) $4.00.
Smith & Hemenway Co.:
Ajax.....60%
Diamond B, No. 2, case lots, ₱ doz $6.00
Diamond B, No. 3, case lots, ₱ doz $5.50
Eureka.....50%
Giant, No. 1, ₱ doz. $18; No. 2, $16.50; No. 3, $15.....40%
Yankee.....66⅔%

Pulleys—Single Wheel—

Inch.....	*2*	*2½*	*3*
Awning...doz	*$0.55*	*.85*	*1.15*

Hay Fork, Swivel or Solid Eye..... doz., 4 in., $1.15; 5 in., $1.40

Inch	*2*	*2¼*	*2½*
Hot House,doz	*$0.70*	*.90*	*1.25*

Inch ...	*1¼*	*1½*	*1¾*	*2*
Screw.....doz	*$0.16*	*.19*	*.23*	*.30*
Inch	*1¾*	*2*	*2¼*	*2½*
Side.....doz	*$0.50*	*.40*	*.55*	*.65*
Inch.....	*1½*	*1¾*	*2*	*2½*
Tackle ....doz	*$0.30*	*.42*	*.58*	*1.00*

Stowell's:
Ceiling or End, Anti-Friction.....60%
Dumb Waiter, Anti-Friction...60&10%
Hay Fork, Anti-Fricton, 5-in. Wheel, ₱ doz. $12.00.....50%
Electric Light.....60%
Side, Anti-Friction.....0&10%

Sash Pulleys—

Common Frame: Square or Round End, per doz., 1¾ in., 13c; 2 in., 15c
Auger Mortise, no Face Plate, per doz. 1¾ in., 12c.; 2 in., 15c.
Auger Mortise, with Face Plate, per doz., 1¾ in., 13c.; 2 in., 15½c.
Acme.....1¾ in., 16¢; 2 in., 19¢
Common Sense, 1¾ in.... ₱ doz., 18¢; 2 in., 20¢.
Fox-All-Steel, Nos. 3 and 7, 2 in. ₱ doz 25¢
Grand Rapids All Steel Noiseless....50%
Ideal No. 13.....1¾ in., ₱ doz., 16¢
Niagara.....1¾ in., 16¢; 2 in., 19¢
No. 26, Troy....1¾ in., 14½¢; 2 in., 16¼¢
Star.....1¾ in., 16¢; 2 in., 19¢
Tackle Blocks—See *Blocks.*

Pumps—

Cistern.....60@60&10%
Pitcher Spout.....75¢10@80%
Wood.....50@50&10%
Pump Leathers, Lower and Plunger Valves—Per gro.:

Inch..	*2*	*2¼*	*2½*	*2¾*
	$2.20	*2.50*	*2.75*	*3.00*

Inch..	*3*	*3¼*	*3½*	*3¾*	*4*
	$3.30	*3.60*	*3.85*	*4.10*	*4.40*

Barnes Dbl. Acting (low list)..... 50%
Contractors' Rubber Diaphragm No. 2 H. & L. Block Co.....$16.00
Flint & Walling's Fast Mail (low list).55%
Flint & Walling's Pitcher Spout.....75%
Loud's Suction Pumps, U. S. Co.....20%
Myer's Pumps, low list.....50%
Myers' Power Pumps.....50%
Daisy Spray Pump.....₱ doz. $7.50
Myers' Spray Pumps.....50&10%

Punches—

Saddlers' or Drive, good..doz. 65@70c
Spring, single tube, good quality... $1.75@2.00
Revolving (4 tubes)...doz. $3.75@4.00
Bemis & Call Co.'s Cast Steel Drive....50%
Bemis & Call Co.'s Check.....55%
Bemis & Call Co.'s Spring.....50%
Morrill's No. 1 (A.B.C.), ₱ doz., $15.00..50%
No. 2, ₱ doz. $22.50.....50%
No. 2, Metal, ₱ doz., $45.00.....50%
Bench Punch, each, $40.00.....50%
Niagara Hollow Punches.....40%
Niagara Solid Punches.....55&10%
Steel Screw, B. & K. Mfg. Co.....40%
Tinners' Hollow, P., S. & W. Co.35@35&5%
Tinners' Solid, P., S. & W. Co., ₱ doz., $1.44.....60%

Rail— Barn Door, &c.—

Cast Iron, Barn Door: Flange Screw Holes for Rd. Groove Wheels:

½	*⅝*	*¾ in.*
$1.70	*$2.10*	*$3.00 100 feet.*

Angular for Sq. Groove Wheels:

Small	*Med.*	*Large.*	
$1.00	*1.95*	*2.70*	*100 feet.*

Sliding Door. Brazed Wr't Iron, ft. 6½c
Sliding Door, Iron Painted....2½@3c
Sliding Door, Wrought Brass, 1⅛ in.....lb. 36c..30%
Allith Mfg. Co. Reliable Hanger Track ₱ foot.....10¢
Cronk's Double Braced Steel Rail, ₱ foot.....3½¢
Cronk's O. N. T. Rail.....3½¢
Lanes' O. N. T., ₱ 100 ft., 1 inch, $3.10; 1¼ inch, $3.90; 1½ inch, $4.85.
Lanes' Standard, ₱ 100 ft.....3.75
Lawrence Bros.' .....₱ ft. 4½¢
Lawrence Bros. New York.....3½¢
McKinney's Hinged Hanger Rail ₱ foot, 11¢.....50%
McKinney's None Better.....₱ ft. 3½¢
McKinney's Standard .....₱ ft. 4 ¢
Myers' stayon Track .....50&10%
Smith's Wrought Bracket, Plain.....3½¢
Smith's Special .....4½¢
Smith's Never Jump, per ft. 11¢.....50%
Smith's Plain Steel 30%
Smith's Milled Steel.....4½¢
Stowell's Cast Rail .....1½¢
Stowell's Steel Rail, Plain.....25%
Stowell's Wrought Bracket, Plain...3½¢
Swett's Hylo, per ft. 11¢.....50&10%
Swett's P. L. B. Steel Rail, ₱ 100 ft. $3.00

Rakes—

Net Prices, Malleable Rakes:

10	*12*	*14*	*16-tooth*
Shank.....$1.50	*1.60*	*1.75*	*1.85*
Socket.....$1.65	*1.80*	*1.95*	*2.10*

Steel, August 1, 1899, List...70&5&20%
Malleable.....70&10@75&5%
Lawn Rakes, Metal Head, per doz., 20 teeth.....$3.25@3.50
24 teeth.....$3.60@3.75
Fort Madison Red Head Lawn.....$3 25
Fort Madison Blue Head Lawn.....$3.00
Jackson Lawn, 29 and 30 teeth, ₱ doz $4.00
Kohler's:
Lawn Queen, 20-tooth, ₱ doz.....$3.45
Lawn Queen, 24-tooth, ₱ doz $3.60
Paragon, 20-tooth, ₱ doz $2.75
Paragon, 24-tooth, ₱ doz.....$3.00
Steel Garden, 14-tooth, ₱ doz.....$2.85
Malleable Garden, 14-tooth, ₱ doz..$3.00

Rasps, Horse—

Disston's.....75%
Heller Bros.....70&5@70&10&5%
McCaffrey's American Standard..... 60&10&5%
New Nicholson.....70&10%
see also *Files.*

Razors—

Borasic.....60 & 10%
Fox Razors, No. 42, .. ₱ doz. $30.00 } 40&
Fox Razors, No. 44, .. ₱ doz. $30.00 } 10%
Fox Razors, No. 84, Platina, ₱ doz. } -25.00
Red Devil.....60%
Silberstein:
Carbo Magnetic.....$18.00
Griffon, No. 65.....$15.00
Griffon, No. 00.....$12.00
All other Razors.....40%
Safety Razors.....40%

Safety Razors—

New Gem, in Tin Boxes.....₱ doz. $12.00
New Gem, Extra Blades .....₱ doz. $6.35
Gem Outfits (Razor, Strop, etc.).....₱ doz. $ 5.60
Complete Razor, extra Blade in Leather Case.....₱ doz. $27.00

Reels— Fishing—

Bishop's Independent Fish Reel Spooler, ₱ doz.....$30 00
Hendryx:
M 6, Q 6, A 6, B 6, M 9¼ 4008, Silver Rubber Populo, Nickeled Populo, Aluminum, German Silver, Bronze, 3-0 4 N, 6 N, 4 N to 8 PN.....33⅓%
6 RW, 102 P and RN, 202 P and 1 PN.40%
G 9.....20%
24 N to 28 PN.....35&10&10%
124 N, 974 PN, 002904 PN, 1020 R and PRN, 202 PR and PRN.....50&5%
2904 N.....40&10&5%
5000 P N and N.....50%
2964 P.....50&10&5%
2904 PN.....60%
0924 N.....40&10%
02084 N.....45&12½&5%
Single Action Trout.....40&10%
986 P N, 802 and 802 N.....40&10%
Competitor, 304 and 1304 PN 35%
00904 P and PN.....40&5%
Safety and Salmon.....30%

Registers—*List Sept. 2, 1901.*

Black Jap.....
White Jap.....
Bronzed..... } *75&10 @80%*
Nickel Plated.....
Electro Plated.....
There is a good deal of irregularity in prices of Registers.

Registers, Cash—

Sun, No. 10, Metal Cabinet.....$30.00
Sun, No. 10, Wood Cabinet.....$25.00

Revolvers—

Single Action.....85@90c
Double Act n, except 44 cal..$1.40@1.60
Double Action, 44 caliber. $1.75@1.95
Automatic .....$3 25@3.50
Hammerless.....$3.75@4.10

Riddles, Grain or Sand—

16 in., per doz.....$2.75@3.00
17 in., per doz.....$3.00@3.25
18 in., per doz.....$3.25@3.50

Rings and Ringers—Bull Rings—

	2	*2½*	*3 Inch.*
Steel..	*$0 70*	*0.75*	*0.80 doz.*
Copper..... 1.00		*1.10*	*1.35 doz.*

Hog Rings and Ringers—

Hill's Rings....gro. boxes, $4.25@4.50
Hill's Ringers, Gray Iron. doz. 55@60c
Hill's Ringers, Mal. Iron, doz. 75@80c
Blair's Rings.....per gro. $5.00@5.25
Blair's Ringers...per doz. $0.60@ .65
Brown's Rings....per gro. $5.50@5.75
Brown's Ringers..per doz. $0.75@1.00

Rivets and Burrs—

Copper.....50&10@50&10@5&5%
Iron or Steel:
Tinners' .....75@75&10%
Miscellaneous .....75@75&10%

Rollers—

Acme, Stowell's Anti-Friction 50%
Barn Door, Sargent's list.....60%
Cronk's Stay.....60&5%
Cronk's Brinkerhoff.....66⅔%
Lane's Stay .....33⅓&5%
Stowell's Barn Door Stay.....₱ doz. $1.25

Rope—

Manila, 7-16 in. and larger, tarred or untarred...lb. 11 @12 c
Manila, ⅜-inch .. lb. 11½@12½c
Manila, ¼ & 5-16 in....lb. 12½@13 c
Manila, Hay, Hide and Bale Ropes, Medium and Coarse.....lb. 12 @12½c
Sisal, 7-16 in. and larger lb. 9 @10 c
Sisal, ⅜-inch .. lb. 9½@10½c
Sisal, ¼ and 5-16 Inch..lb. 10 @11 c
Sisal, Hay, Hide and Bale Ropes, Medium and Coarse..... lb. 9 @10 c
Sisal, Tarred, Medium Lath Yarn.....lb. 8½@ 9½c
Cotton Rope:
Best .. ½-in. and larger, lb. 13½c
Medium..¼-in. and larger, lb. 11 c
Com ....¼-in. and larger, lb. 9 c
Jute Rope:
Thread No. 1, ¼-in. and up, lb. 6½c
Thread No. 2, ¼-in. and up, lb. 6 c
Yarn, ¼-in. and up.. lb. 5 @5½c
Old Colony Manila Transmission Rope, ₱ lb 17½¢

Wire Rope—

Galvanized.....40&5%
Plain .....45&5%

Ropes, Hammocks—

Covert Mfg. Co.:
Jute .....40&5%
Sisal 30%
Covert Saddlery Works. .....60&5%

Rules—

Boxwood.....60&10@60&10&5%
Ivory .....35&10@35&10&5%
Chapin-Stephens Co.:
Boxwood.....60@60&10%
Ivory .....35@35&10&10%
Miscellaneous.....50@50&10&10%
Combination .....55@55&10%
Stationers'.....10@10&10%
Lufkin's Steel.....50&10%
Lufkin's Lumber.....60&10%
Stanley R. & L. Co.:
Boxwood .....60@60&10%
Ivory .....35@35&10&10%
Upson Nut Co.:
Boxwood.....60@60&10%
Ivory.....35&10@35&10&10%

Sash Locks—See *Locks, Sash.*

Sash Weights—

See *Weights, Sash.*

Sausage Stuffers or Fillers

—See *Stuffers or Fillers, Sausage.*

Saw Frames—See *Frames, Saw.*

Saw Sets—See *Sets, Saw.*

Saw Tools—See *Tools, Saw.*

Saws—

Atkins:
Circular.....50@50&10%
Hand .....50&10@60%
Cross Cuts.....35&5%
Mulay, Mill and Drag .....50&10%
One-Man Saw.....40%
Wood Saws.....40%
Hand, Compass, &c.....40%
Chapin-Stephens Co.:
Turning Saws and Frames .30@30&10%
Diamond Saw & Stamping Works:
Sterling Kitchen Saws.....25%
Disston's:
Circular, Solid and Inserted Tooth..50%
Band, 3 to 14 in. wide.....60%
Band, ¼ to 2¾.....70%
Crosscuts.....45%
Narrow Crosscuts.....50%
Mulay, Mill and Drag.....50%
Framed Woodsaws.....35%
Woodsaw Blades.....35%
Woodsaw Rods.....25%
Hand Saws, Nos. 12, 99, 9, 16, d100, D8, 120, 7⅜, 77, 8.....25%
Hand Saws, Nos 7, 107, 107½, 3, 1, 0, 00, Combination.....30%
Compass, Keyhole, &c.....25%
Butcher Saws and Blades.....35%
C. E. Jennings & Co.'s.:
Back Saws.....25&10%
Butcher Saws.....30&10%
Compass and Key Hole Saws.35&5&10%
Framed Wood Saws.....30&10%
Hand Saws .....20&2½&10%
Wood Saw Blades.....30&10%
Millers Falls:
Butcher Saws.....15&10%
Star Saw Blades.....15&10%
Peace:
Circular and Mill 50%
Cross Cuts, list Jan. 1, '99.....50%
Hand, Panel and Rip.....30%
Richardson:
Circular and Mill 50%
Hand, &c.....30%
X Cuts, list Jan. 1, '99.....50%
Simonds':
Circular Saws.....50%
Crescent Ground Cross Cut Saws..35%
One-Man Cross Cuts.....40&10%
Gang Mill, Mulay and Drag Saws..50%
Band Saws.....50%
Back Saws.....25@25&7½%
Butcher Saws.....35@35&7½%
Hand Saws.....25@25&7½%
Hand Saws, Bay State Brand.....45%
Compass, Keyhole, &c .....25@25&7½%
Wood Saws.....35@35&7½%

Hack Saws—

Atkins' Hack Saw Blades A A A. ... 30%
Disston:
Concave Blades.....25%
Keystone.....40%
Hack Saw Frames.....30%
Fitchburg File Works, The Best.....25%
C. E. Jennings & Co.'s:
Hack Saw Frames, Nos. 175, 180.... 35&5&10%
Hack Saws, Nos. 175, 180, complete. 35&5&10%
Griffin's Hack Saw Frames .. 35&5&10%
Griffin's Hack Saw Blades.....35&5&10%
Star Hack Saws and Blades.....15&10%
Sterling Hack Saw Blades.....25%
Sterling Hack Saw Frames.....20%

Scroll—

Barnes' No. 7, $15.....25%
Barnes' Scroll Saw Blades.....40%
Barnes' Velocipede Power Scroll Saw, without boring attachment, $18; with boring attachment, $20.....20%
Lester, complete, $10.00.....15&10%
Rogers, complete, $4.00.....15&10%

Scalers, Fish—

Bishop's Lightning.....₱ doz. $3.00
Covert's Saddlery Works .....60&10%

Scales—

Family, Turnbull's.....50@50&10%
Counter:
Hatch. Platform, ½ oz to 4 lbs. doz $5.50
Two Platforms, ½ oz to 8 lbs. doz. $16
Union Platform, Plain..$1.70@1.90
Union Platform, Striped $1.85@2.15
Chatillon's:
Eureka 25%
Favorite 40%
Grocers' Trip Scales.....50%
Pelouze Scales—Household, Counter, Candy, Ice, Postal, Computing.....50%
"The Standard" Portables.....45%
"The Standard" R. R. and Wagon.....50%

Scrapers—

Box, 1 Handle.....doz. $2.25@2.50
Box, 2 Handle.....doz. $3.00@3.50
Ship Light, $2.50; Heavy, $4.00
Adjustable Box Scraper (S. R. & L. Co.) $6.00 .....30@30&10%
Chapin-Stephens Co., Box.....50@50&10%

Screens, Window, and Frames—

Flyer Pattern Window Screen...60@60&5%
Maine Window Screen Frames...40&10&5%
Perfection Window Screens.....60@60&5%
Phillips' Window Screen Frames....60&5%
Porter's:
Fairview Window Screens..... 60&5@60&5&2½%
Hummer Window Screens..... 60&5@60&5&2½%
Klondike Window Screens..... 60&5@60&5&2½%
See also *Doors.*

Screws—Bench and Hand—
Bench, Iron..doz. 1 in..$2.75@3.00 :
1¼, $3.25@3.50: 1¼, $3.85@4.25
Bench, Wood, Beech..doz. $3.00@3.50
Hand, Wood.....30@30&5%
R. Bliss Mfg. Co, Hand.....30%
Chapin-Stephens Co., Hand.....30&30&10%

Coach, Lag and Hand Rail—
Lag, Common Point, list Oct. 1. '99.....70&15@...%
Coach and Lag, Gimlet Point, list Oct. 1. '99.....70&10@...%
Hand Rail, list Jan. 1, '81.60&10@...%

Jack Screws—
Standard List.....75&10@80&5%
Millers Falls.....50&10&10%
Millers Falls, Roller.....50&10%
P. S. & W.....50&50&10%
Sargent.....70&10%

Machine—
List Jan. 1, '98.
Flat or Round Head, Iron..50@50&10%
Flat or Round Head, Brass 50@50&10%

Set and Cap—
Set (Iron or Steel).....70%
Sq. Hd. Cap.....65%
Hex. Hd. Cap.....65%
Rd. or Fillister Hd. Cap.....60%

Wood—
List Jan. 1, 1900.
Manufacturers' printed discounts :
Flat Head, Iron.....87½&10@...%
Round Head, Iron.....85&10@...%
Flat Head, Brass.....85&10@...%
Round Head, Brass.....80&10@...%
Flat Head, Bronze...77½&10@...%
Round Head, Bronze.....75&10@...%
Drive Screws.....87½&10%

Scroll Saws—See *Saws, Scroll.*

Scythes—
Per doz.
Clipper Pattern, Grass...$4.50@$5.00
Full Polished Clipper.....$5.00@$5.50
Grain.....$7.00@$7.50
Clipper, Grain.....$7.75@$8.25
Weed and Bush.....$4.75@$5.00

Seeders—
Raisin—
Enterprise.....35&30%

Sets—
Awl and Tool—
Brad Awl and Tool Sets :
Wood Hdle., 10 Awls doz. $2.00@2.25
Wood Hdle., 14 Awls, 6 Tools, doz. $2.50@2.60
Aiken's Sets, Awl and Tools :
No. 20, ₱ doz. $10.00.....50&10&10%
Fray's Adj. Tool H'dls...Nos. 1, $12; 2, $18; 3, $12; 4, $9; 5, $7.....50%
C. E. Jennings & Co.'s Model Tool Holders.....30&10%
Millers Falls Adj. Tool H'dls, No. 1, $12; No. 4, $12; No. 5, $18.....15&10%
Stanley's Excelsior :
No. 1, $7.50; No. 2 $4.00; No. 3, $5.50.....30&30&10&10%

Garden Tool Sets—
Ft. Madison, Three Pieces, Hoe, Rake and Shovel.....₱ doz. sets.....$9.00

Nail—
Square.....per gro. $2.25@3.50
Round, Blk. and Pol., assorted.....gro. $1.80@2.50
Octagon.....gro. $4.00@4.25
Knurled, Good.....gro. $5.75@6.00
Buck Brothers.....27½%
Cannon's Diamond Point, ₱ gr. $12..25%
Mayhew's.....per gro. $9.00
Snell's Corrugated, Cup Pt. per gro. $7.50
Snell's Knurled, Cup Pt.....per gro $7.50

Rivet—
Regular list.....70&10@7½%

Saw—
Aiken's:
Genuine.....50&10%
Imitation.....50&10%
Atkin's:
Criterion.....40%
Adjustable.....40%
Bemis & Call Co's.:
Cross Cut.....30%
Hammer, new Pat.....45%
Plate.....20%
Spring Hammer.....30%
Disston's Star and Monarch.....25%
Morrill's No. 1, $15.00.....50%
Nos. 3 and 4, Cross Cut, $20.63.....50%
No. 5, Mill, $30.00.....50%
Nos. 10, 11, 9½, $18.63.....50%
No. 1 Old Style, $10.00.....50%
Giant Royal, Cross Cut.....₱ doz. $9.00
Royal Hand.....₱ doz. $5.40
Talntor Positive, ₱ doz. $18.....60%

Sharpeners, Knife—
Chicago Wheel & Mfg. Co.....65%
Smith & Hemenway Co.....70%

Shaves Spoke—
Iron.....doz. $1.00@1.15
Wood.....doz. $1.65@2.25
Bailey's (Stanley R. & L. Co.).....50&50&10&10%
Chapin-Stephens Co.....50&50&10&10%
Goodell's, ₱ doz. $9.00.....15&10%
Wood's F1 and F2.....50%

Shears—

	7	8	9 in.	
Cast Iron...				
Best	$16.00	18.00	20.00	gro.
Good	$13.00	15.00	17 00	gro.
Cheap	$5.00	6.00	7.00	gro.

Straight Trimmers, &c.:
Best quality, Jap.....70@70&10%
" Nickel.....60@60&10%
Fair qual. Jap.....80@80&5%
" Nickel.....75@75&10%
Tailors' Shears.....40@40&10%
Acme Cast Shears.....40@40&5%
Geneva.....60%
Heinisch's Tailors' Shears.....40%
Wilkinson's Hedge.....1900 list 45%
Wilkinson's Pruning.....40%
Wilkinson's Sheep.....1900 list. 25%

Tinners' Snips—
Steel Blades.....20&5@20&10
Steel Laid Blades.....40&10@50%
Forged Handles. Steel Blades, Berlin.....40@40&10%
Jennings & Griffin Mfg. Co.'s, 6¼ to 10 inch.....30&7½&10%
Niagara Snips.....40%
P., S. & W. Co.....20%

Pruning Shears and Tools—
Cronk's Grape Shears.....33⅓%
Cronk's Pruning Shears.....33⅓%
Disston's Combined Pruning Hook and Saw, ₱ doz. $18.00.....25%
Disston's Pruning Hook, ₱ doz. $12.00.....25%
John T. Henry Mfg. Co.:
Pruning Shears, all grades.....40@40&5%
Orange Shears.....50&10@50&20%
Grape.....40&10@50%
Tree Pruners.....75%
P., S. & W. Co.....33⅓%

Sheaves—Sliding Door—
Stowell's Anti-Friction.....50%
Patent Roller Hatfield's, Sargent's list.....70&10%
Reading.....70&10@75%
R. & E. list.....33⅓%
Wrightsville Hatfield Pattern.....80%

Sliding Shutter—
Reading list.....70&10@75%
R. & E. list.....33⅓%
Sargent's list.....50&10%

Shells—
Shells, Empty—
Brass Shells, Empty :
First quality, all gauges.....60&5%
Climax, Club, Rival, 10 and 12 gauge..65&5%
Paper Shells, Empty :
Acme, Ideal, Leader, New Rapid, Magic 10, 12, 16 and 20 gauge..25&5%
Blue Rival, New Climax, Challenge, Monarch, Defiance, New Victor, Repeater, Yellow Rival, 10, 12, 15 and 20 gauge.....20%
Climax, Union, League, New Rival 10 and 12 gauge.....25%
Climax, Union, League, New Rival, 14, 16 and 20 gauge ($7.50 list)..20%
Expert, Metal Lined and Pigeon, 10, 12, 16 and 20 gauge.....33⅓&5%
Robin Hood, Low Brass.....20&10%
Robin Hood, High Brass.....30&10%

Shells, Loaded—
Loaded with Black Powder.....40%
Loaded with Smokeless Powder, medium grade.....40&5%
Loaded with Smokeless Powder, high grade.....40&10&10%
Robin Hood, Low Brass.....50%
Robin Hood, High Brass.....50&10&5%

Shoes Horse, Mule, &c.—
F. o. b., Pittsburg:
Iron.....per keg $3.85
Steel.....per keg 3.60
Burden's, all sizes, ₱ keg.....$3.90

Shot—
Drop, up to B, 25-lb. bag.....$1.40
Drop, B and larger, per 25-lb. bag $1.65
Buck, 25-lb. bag.....$1.65
Chilled, 25 lb. bag.....$1.85
Dust Shot, 25-lb. bag.....$2.00

Shovels and Spades—
Association List, Nov. 15, 1902.....40%

Sieves and Sifters—
Hunter's Imitation, gro. $11.00@11.50
Buffalo Metallic Blued, S. S. & Co., ₱ gr.:

14&16	16&18	18&20
$12.90	$13.80	$15.00

National Mfg. Co.:
Victor.....per gro. $12.00
Surprise.....per gro. $11.00
No Name.....per gro. $11 00
Shaker (Barler's Pat.) Flour Sifters, ₱ doz., $2.00.....30%

Sievos, Tin Rim—
Per dozen.

Mesh	14	16	18	20
Black, full size	$1.20	1.25	1.30	1.35
Plated, full size	$1.30	1.35	1.40	1.45
Black, scant	$0.95	1.00	1.05	

Sieves, Wooden Rim—
Nested, 10, 11 and 12 Inch.
Mesh 18, Nested, doz.....$0.65@0 75
Mesh 20, Nested, doz.....75@ .85
Mesh 24, Nested, doz.....90@1.00

Sinks—
Cast Iron—
Standard list.....60@60&10%
NOTE.—*There is not entire uniformity lists used by jobbers.*

Skeins Wagon—
Cast Iron.....70@70&10%
Malleable Iron.....40&10@50%
Steel.....40@40&10%

Slates, School—
Factory Shipments.
"D" Slates.....45%
Noiseless Slates.....60&4 tens &5%
Wire Bound.....40%

Slaw Cutters—See *Cutters.*

Slicers, Vegetable—
Sterling No. 10, $2.00.....33⅓

Snaps, Harness—
German.....40@40&10%
Covert Mfg. Co.:
Derby.....30&5&2%
High Grade.....45%
Jockey.....30&10%
Trojan.....45%
Yankee.....30&5&2%
Yankee, Roller.....30&5&2%
Covert's Saddlery Works:
Crown.....60%
German.....60%
Model.....60%
Triumph.....60%
Oneida Community :
Solid Steel.....60&5%
Solid Swivel.....60%
Sargent's Patent Guarded.....60%&10%

Snaths—
Scythe.....50@50&10%

Snips, Tinners'—See *Shears.*

Spoons and Forks—
Silver Plated—
Good Quality.....50&10@60&10&5%
Cheap.....40@60&10%
International Silver Co.
1847 Rogers Bros. and Rogers & Hamilton.....40&10%
Rogers & Bro., William Rogers Eagle Brand.....30&10%
Anchor, Rogers Brand.....60%
Wm. Rogers & Son.....60&10%
Simeon L. & Geo. H. Rogers Co.:
Silver Plated Flat Ware.....60%
No. 77 Silver Plated Ware.....60&10%

Miscellaneous—
German Silver.....60@60&10%
Cattaraugus Cutlery Co.:
Yukon Silver.....50%
Simeon L. & Geo. H. Rogers Co.:
German or Nickel Silver, special list 1.&10%

Tinned Iron—
Teas.....per gro. 45@50c
Tables.....per doz. 90c@$1.00

Springs—
Door—
Gem (Coil).....20%
Star (Coil).....30%
Torrey's Rod, 39 in.....₱ dos. $1.10
Victor (Coil).....50&10&10%

Carriage, Wagon, &c.
1¼ in. and Wider :
Black or ⅛ Bright, lb.....4¾@5 c
Bright, lb.....5¼@5½c
Painted Seat Springs :
1½ x2x 26, per pr.....50@55c
1½ x 2 x 28 per pr.....60@65c
1½ x 3 x 28 and narrower, per pr. 80@85c

Sprinklers, Lawn—
Enterprise.....25@30%
Mackesy.....₱ doz. $1.80
Philadelphia No. 1, ₱ doz. $12; No. 2, $15; No. 3, $24.....30%

Squares—
Nickel plated.....} List Jan. 5, 1900.
Steel and Iron.....} 70&10%
Rosewood Hdl Try Square and T-Bevels.....60&10&10@70%
Iron Hdl. Try Squares and T-Bevels, 50&10@50&10&10%
Disston's Try Sq. and T-Bevels.....70%
Winterbottom's Try and Miter.....40&10@40&10&10%

Squeezers—
Lemon—
Wood, Common, gro., No. 0, $5.25 @$5.50 : No. 1, $6.25@$6.50.
Wood, Porcelain Lined.
Cheap.....doz. $2.00@2.75
Good Grade.....doz. $3.00@3.50
Tinned Iron.....doz. $0.75@1.25
Iron, Porcelain Lined doz. $2.90@3.25

Staples—
Barbed Blind.....lb. 6@6½c
Electricians', Association list.....80&10&10&10%
Fence Staples, See Trade Report.
Galvanized, 10c less than Barb Wire
Polished 20c less than Barb Wire.
Poultry Netting, Staples....per lb.. 5¼@5½c
Grand Crossing Tack Co.'s list....80&10%

Steels, Butchers'—
Dick's.....30%
Foster Bros'.....30%
Hartzell Cutlery Co.....40&5%
C. & A. Hoffmann's.....40%

Steelyards.....25&10@30&10%

Stocks and Dies—
Blacksmiths'.....40&10@50%
Curtis Reversible Ratchet Die Stock.25%
Derby Screw Plates.....25%
Gardner Die Stocks No. 1.....50%
Gardner Die Stocks, larger sizes.....40%
Green River.....25%
Lightning Screw Plate.....25%
Little Giant.....25%
Reece's New Screw Plates.....25@30%

Stone—
Scythe Stones—
Chicago Wheel & Mfg. Co:
Gem Corundum, 9) inch, $3.00 per gro., 12 inch, $10.
Pike Mfg. Co. 1901 list:
Black Diamond S. S.....₱ gro. $12.00
Lamoille S. S.....₱ gro. $11.00
White Mountain S. S.....₱ gro. $9.00
Green Mountain S. S.....₱ gro. $6.00
Extra Indian Pond S. S. ₱ gro. $7.50
No. 1 Indian Pond S. S. ₱ gro. $7.00
No. 2 Indian Pond S. S. ₱ gro. $4.50
Leader Red End S. S. ₱ gro $4.50
Balance of 1901 list 33⅓%

Oil Stones, &c.
Chicago Wheel & Mfg. Co., 1901 list:
Gem Corundum Oil, Double Grit.....50%
Gem Corundum Axe, Single or Double Grit.....55%
Gem Corundum Slips.....55%
Gem Corundum Razor Hones.....50%
Pike Mfg. Co. 1901 list: ₱ lb.
Arkansas Stone, No. 1, 3 to 5¼ in. $2.80
Arkansas Stone, No. 1, 5¼ to 8 in. $3.50
Arkansas Slips N. 1.....$4.00
Lily White Washita 4 to 8 i.....60¢
Rosy Red Washita, 4 to 8 in.....60¢
Washita Stone, Extra, 4 to 8 in..50¢
Washita Stone, No. 1, 4 to 8 in..40¢
Washita Stone, No. 2, 4 to 8 in..30¢
Lily White Slips.....90¢
Rosy Red Slips.....90¢
Washita Slips, Extra.....80¢
Washita Slips, No. 1.....70¢
India Oil Stones (entire list).....33⅓%
Hindostan No. 1, Regular.....₱ lb 8¢
Hindostan No. 1 Small.....₱ lb 10¢
Axe Stones (all kinds).....40%
Turkey Oil Stones, ex. 5 tos in. ₱ lb 80¢
Queer Creek Stones, 4 to 8 in.....20¢
Queer Creek Slips.....40¢
Sand Stone.....5¢
Belgian, German and Swaty Razor Hones.....50%
Natural Grit Carving Knife Hones, ₱ doz.....$3.00
Quick Edge Pocket Knife Hones, ₱ doz.....$3.00
Mounted Kitchen Sand Stone, ₱ doz.....$1.50

Stoners—
Cherry—
Enterprise.....25@30%

Stops Bench—
Millers Falls.....15&10%
Morrill's...₱ doz., No. 1, $10.00.....50%
Morrill's, No. 2, $12.50.....50%

Door—
Chapin-Stephens Co.....60@60&10%

Plane—
Chapin-Stephens Co.....30%

Straps—
Box—
Cary's Universal, case lots.....20@10%

Hame—
Covert's Saddlery Works.....60&10%

Stretchers, Carpet—
Cast Iron, Steel Points....doz. 55@60c
Socket.....doz. $1.75

Stuffers, Sausage—
Enterprise Mfg. Co.....25@25&7½%
National Specialty Mfg. Co., list Jan. 1, '97.....30%

Supports, Porch—
Hoffman's Porch Supports....₱ doz. 25¢

Sweepers, Carpet—
National Sweeper Co.: Per doz.
Marion, Roller Bearing, regular finishes, full Nickel.....$24.00
Marion Queen, Roller Bearing, Fancy Veneers, full Nickel.....$27.00
Monarch, Roller Bearing, Nickel..$22.00
Monarch, Roller Bearing, Jap'ned..$20.00
Marion Queen, Roller Bearing, Regular Finishes, full Nickel.....$24.00
Transparent, Roller Bearing, Plate Glass Top, Nickel.....$32.00
Monarch Extra, Roller Bearing, (17-inch case), Nickel.....$36.00
Monarch Extra, Roller Bearing (17-inch case), Japanned.....$33.00
Perpetual, Regular Bearings, Nkl. $20.00
Perpetual, Regular Bearings, Jap. $18.00
NOTE.—*Discount of 30c per dozen on three-dozen lots. Discount of $1 per dozen on five-dozen lots.*

Tacks Brads, &c.—
List Jan. 15, '99.
Carpet Tacks, American.....90¢25¢5@....%
American Cut Tacks..90¢20¢5@....%
Swedes Iron Tacks...90¢30¢5@....%
Swedes Upholsterers' Tacks.....90¢45&10¢5@....%
Gimp Tacks.....90¢45¢5@....%
Lace Tacks.....90¢40@....%
Trimmers' Tacks..90¢30¢10¢5@....%
Looking Glass Tacks...70¢10@....%
Bill Posters' and Railroad Tack....90¢45¢5@....%
Hungarian Nails....80¢20¢5@....%
Common and Patent Brads....80¢10%
Trunk and Clout Nails..80¢5@....%
NOTE.—*The above prices are for Straight Weights.* An extra 5% is given Star Weights** and an extra 10&5% on Standard Weights.****

Miscellaneous—
Double Pointed Tacks...90 and 5 tens
Steel Wire Brads, R. & E. Mfg. Co's list.. 50&10@60%

See also *Nails, Wire.*

Tanks, Oil—

	Each.
Emerald, S. S. & Co.	30-gal $3.40
Emerald, S. S. & Co.	60-gal., $4.25
Queen City S. S. & Co.,	50-gal.....$3.65
Queen City S. S. & Co.,	60-gal.....$4.50

Tapes, Measuring—
American Asses' Skin.....40¢10@50%
Patent Leather.....25@30&5%
Steel.....40@40&5%
Chesterman's.....25@25&5%
Keuffel & Esser Co., Steel and Metallic, Lower list, 1899.....35%
Lufkin's Steel.....33⅓&35%
Lufkin's Metallic.....30@30&5%

Teeth Harrow—
Steel Harrow Teeth, plain or headed, ⅝ inch and larger, per 100 lbs...$3.00

Thermometers—
Tin Case.....80¢10@80¢10¢5%

Ties, Bale—Steel Wire.
Single Loop.....80¢2¼
Monitor, Cross Head, Etc.....70%

Ties, Wall—
Cleveland Wire Spring Co.:
Galv. Steel 5-32 x 6¼ in. ₱ 1000..$10.00
Galv. Steel 5-32 x 8¼ in. ₱ 1000..$11.00
Galv. Steel 5-32 x 11¼ in. ₱ 1000..$12.00
Galv. Steel 5-32 x 15½ in. ₱ 1000..$14.00

Tinners' Shears, &c.—
See *Shears, Tinners', &c.*

Tinware—
Stamped, Japanned and Pieced, sold very generally at net prices.

Tips, Safety Pole—
Covert's Saddlery Works.....60&10%

Tire Benders, Upsetters, &c.—See *Benders and Upsetters, Tire.*

Tools—Coopers'—
L. & I. J. White ..... 30@20&5%

Hay—
Myers' Hay Tools 30%

Saw—
Atkins' Cross Cut Saw Tools 40%
Simonds' Improved 33⅓%
Simonds' Crescent 25%

Ship—
L. & I. J. White 25%

Transom Lifters—
See *Lifters, Transom.*

Traps—Fly—
Balloon, Globe or Acme ..... doz. $1.15@1.35; gro. $11.50@12.00
Harper, Champion or Paragon ..... doz. $1.25@1.40; gro. $13.00@13.50

Game—
Oneida Pattern ..... 80@30&5%
Newhouse ..... 45&45&5%
Hawley & Norton ..... 65&5&65&10%
Victor (Oneida Pattern) ..... 75&75&5%
Star (Blake Pattern) ..... 60&5&60&10%

Mouse and Rat—
Mouse, Wood, Choker, doz. holes ..... 8½@9c
Mouse, Round or Square Wire ..... doz. 85@90c
Marty French Rat and Mouse Traps (Genuine):
No. 1, Rat, Each $1.12½; ₱ doz. $12.00
No. 3, Rat, ₱ doz. $.6.00; case of 50 $5.25 doz.
No. 3½, Rat, ₱ doz. $4.75; case of 72 $4.25 doz.
No. 4, Mouse, ₱ doz. $3.50; case of 7 $2.75 doz.
No. 5, Mouse, ₱ doz. $2.75; case of 150 $2.25
Schuyler's Rat Killer, No. 1, ₱ gr. $30.00
No. 2, ₱ gr. $30.00; Mouse, No. 3, $18.00 ..... 50%

J. M Mast Mfg. Co.: Per gro.

Mouse.	Rat.
Blizzard ..... No. 12, $3.00	No. 1, $9 50
Old Nick ..... No. 30, 2.22	No. 2, 8.40
Joker ..... No. 5, 2.10	No. 3, 8.40

Imp'd Snap Shot, Mouse, per gro., 2 hole, $2 40.
Imp'd Snap Shot, Mouse, per gro., 4 hole, $4.20.

Trimmers Spoke—
Bonney's Nos. 1 and 2 ..... 40%
Wood's E 1 ..... 50%

Trowels—
Disston Brick and Pointing 30%
Disston Plastering 25%
Disston "Standard Brand" and Garden Trowels 35%
Kohler's Steel Garden Trowels, 5 in. ..... ₱ gro. $5.00
Kohler's Steel Garden Trowels, 6 in. ..... ₱ gro. $6.00
Never-Break Steel Garden Trowels ..... gro. $6.00
Peace's Plastering 30%
Rose Brick and Plastering ..... 25&5%
Woodrough & McParlin Plastering 25%

Trucks, Warehouse, &c.—
B. & L. Block Co.:
New York Pattern ..... 50&10%
Western Pattern ..... 60&10%
Handy Trucks ..... per doz. $16.00
Grocery ..... per doz. $15.00
Daisy Stove Trucks, Improved pattern, ₱ doz. $18.50
Model Stove Trucks ..... ₱ doz. $18.50

Tubs, Wash—

	No. 1	2	3
Galvanized, per doz.	*$4.75*	*5.25*	*6.00*

Galvanized Wash Tubs (S. S. & Co.):

	No. 1	2	3	10	20	30
Per doz.	$5.25	6.00	6.75	6.50	7.00	8.00

Twine—Miscellaneous—

Flax Twine—	BC	B.
No. 9, ¼ and ½-lb. Balls	21½c	23½c
No. 12, ¼ and ½ lb. balls	17½c	19½c
No. 18, ¼ and ½-lb. Balls	15½c	17½c
No. 24, ¼ and ½-lb. Balls	15 c	17 c
No. 36, ¼ and ½-lb. Balls	14½c	16½c

Chalk Line, Cotton, ½-lb Balls ..... 22@32½c
Cotton Mops, 6, 9, 12 and 15 lb. to doz 8c
Cotton Wrapping 5 Balls to lb ... according to quality ..... 11c@17c
American 2-Ply Hemp, ¼ and ½-lb. Balls ..... 13@14c
American 3 Ply Hemp, 1-lb. Balls ..... 13@14c
India 2-Ply Hemp, ¼ and ½-lb. Balls (Spring Twine) 8c
India 3-Ply Hemp, 1-lb. Balls 8c
India 3-Ply Hemp, 1¼-lb. Balls 7c
2, 3, 4 and 5-Ply Jute, ½-lb. Balls ..... 8@9c
Mason Line, Linen, ½-lb. Balls 45c
No. 2½ Mattress, ¼ and ½-lb. Balls 37c
Wool, 3 to 6 ply ..... 5@5½c

Binder—

	Cents per lb
Sisal	10¼
Standard	11¾
Standard Manila (550 ft.)	11
Manila (600 ft.)	12
Pure Manila (650 ft)	12¾

F.o.b. Eastern Mill. Carload lots ¼ cent less.

Vises—
Solid Box ..... 50&10@50&10&5

Parallel—
Athol Machine Co.:
Simpson's Adjustable 40%
Standard 40%
Amateur 25%
Bonney's 40%
Columbian Hdw. Co 40%
Emmert Universal:
Pattern Makers' No. 1 ..... $15.00 net
Pattern Makers' No. 2 ..... $13.00 net
Machinist and Tool Makers' ..... $15.00 net
Fisher & Norris Double Screw ..... 15&10%
Hollands':
Machinists' 40%
Keystone ..... 65&5%
Lewis Tool Co ..... 20&30%
Merrill's 20%
Miller's Falls ..... 50&10&10%
Parker's:
Victor ..... 20@25%
Regulars ..... 20@25%
Vulcan's ..... 40@45%
Combination Pipe ..... 55@60%
Prentiss ..... 20@25%
Sargent's 40%
Smith & Hemenway Co.:
Machinists 40%
Jewelers 33⅓%
Snediker's X. L 33⅓%
Stephens' 33⅓%

Saw Filers'—
Bonney's, No. 1, $13; No. 3, $16 . 50&5%
Disston's D 3 Clamp and Guide, ₱ doz $30 ..... 25%
Reading 60%
Wentworth's Rubber Jaw, Nos. 1, 2 and 3 ..... 45&50%

Wood Workers'—
Wyman & Gordon's Quick Action, 6 in., $6.00; 9 in., $7.00; 14 in., $8.00.

Miscellaneous—
Bignall & Keeler Combination Pipe Vise 60%
Parker's Combination Pipe:
87 Series 60%
187 Series ..... 60&5%
No. 870 ..... 40%

Wads—Price Per M.

B. E., 11 up	60c
B. E., 9 and 10	70c
B. E., 8	80c
B. E., 7	80c
P. E., 11 up	$1.00
P. E., 9 and 10	1.25
P. E., 8	1.50
P. E., 7	1.50
Ely's B. E., 11 and larger	$1.70@1.75
Ely's P. E., 12 to 20	$3.00@3.25

Disc. 15%

Ware, Hollow—
Cast Iron, Hollow—
Stove Hollow Ware:
Ground ..... 50@10@60%
Unground ..... 60@5@65%
White Enameled Ware:
Muslin Kettles 70%
Covered Ware:
Tinned and Turned 50%
Enameled 50%
See also *Pots Glue.*

Enameled—
Agate Nickel Steel Ware, list Nov. 1, '01 ..... 50&10%
Iron Clad Ware ..... 70&10%
Lava, Enameled ..... 40&10%
Never Break Enameled 50%

Tea Kettles—
Galvanized Tea Kettles:

Inch	6	7	8	9
Each	*45c*	*50c*	*55c*	*65c*

Steel Hollow Ware.
Avery Spiders & Griddles ..... 65&5&5%
Avery Kettles 50%
Porcelained ..... 50&5&50&10%
Never Break Spiders and Griddles ..... 65&5%
Never Break Kettles 60%
Solid Steel Spiders & Griddles ..... 65&5%
Solid Steel Kettles 60%

Warmers, Foot—
Pike Mfg. Co., Soapstone ..... 40@40&10%

Washboards—
Solid Zinc: ₱ doz
Crescent, family size, bent frame. $3.00
Red Star, family size, stationary protector $3.00
Double Zinc Surface:
Saginaw Globe, family size, stationary protector $2.65
Cable Cross, family size, stationary protector $2.90
Single Zinc Surface:
Naiad, familysize, open back perforated $2.40
Saginaw Globe, protector, family size, ventilated back $2.25
Brass Surface:
Brass King, Single Surface, open back $3.00
Nickel Plate Surface:
No. 1001 Nickel Plate, Single Surface $3.00

Washers—
Leather, Axle—
Solid ..... 85c@10c@10@85c@10c@10c@10%
Patent ..... 85c@10@85c@20%
Coil: ⅞ 1 1¼ 1¼ Inch.
19c 11c 12c 18c per box

Iron or Steel—
Size bolt .... 5-16 ⅜ ½ ⅝ ¾
Washers $6.90 5.50 4.60 4.40 4.20
In lots less than one keg add ½c per lb., 5-lb. boxes add ½c to list.

Cast Washers—
Over ½ inch, barrel lots, per lb. ..... 1¾@2c

Waterers, Hog—
Improved Dewey ..... ₱ doz $26.00

Wedges—
Oil Finish ..... lb. 2.90@3.10c

Weights—
Covert's Saddlery Works ..... 60&10%

Hitching—
Sash—
Per ton, f.o.b. factory:
Eastern District $26.00
Western, Central and Southern Districts $27.00

Wheels, Well—
8-in., $1.6 @1.80; 10-in., $2.00@2.25; 12-in., $2.50@2.65; 14-in., $3.00@3.25

Wire and Wire Goods—
Bright and Annealed:
6 to 9 ..... 72½c@5@72½c&10%
10 to 18 ..... 72½c@10@72½c@10c&5%
19 to 26 ..... 75c@10c@2½@75c@10c@7½%
27 to 36 ..... 75c@10c@7½@80c@2½%
Galvanized:
6 to 18 ..... 70@70c&5%
19 to 26 ..... 72½c@5@72½c@10%
27 to 36 ..... 72½c@10@72½c@10c&5%
Coppered:
6 to 9 ..... 70c&5@70c@10%
10 to 18 ..... 70c@10@70c@10c&5%
19 to 26 ..... 75c@7½@75c@10c@2½%
27 to 36 ..... 75c@10@75c@10c&5%
Tinned:
6 to 14 ..... 75@75c@7½%
15 to 18 ..... 72½c@75@75%
19 to 26 ..... 70c&5@70c&5c&5%
27 to 36 ..... 70@70c&5%
Annealed Wire on Spools ..... 70@70c&5%
Brass and Copper Wire on Spools ..... 60@50c&5%
Brass, list Feb. 26, '96 ..... 25@30%
Copper, list Feb. 26, '96 ..... 15%
Cast Steel Wire 50%
Stubs' Steel Wire ..... $6.00 to £. 50%
Wire Clothes Line, see *Lines.*
Wire Picture Cord, see *Cord.*

Bright Wire Goods—
List April 1, 1901 ..... 85c@10c@10@90%

Wire Cloth and Netting—
Galvanized Wire Netting ..... 80c@10%
Painted Screen Cloth per 100 ft. $1.15
Light Hardware Grade:
2-8 Mesh, Plain (8c. list) sq. ft. ..... 1¾@2c
2-8 Mesh, Galv. (8c. list) sq. ft. ..... 2½@2¾c

Wire, Barb—See *Trade Report.*

Wrenches—
Agricultural ..... 80@80c&10%
Baxter Pat'n S Wrenches ..... 70c&5@70c&10%
Drop Forged S ..... 45@45c&5%
Acme ..... 60&10%
Alligator 70%
Alligator Pattern 70%
Bull Dog 70%
Bemis & Call's:
Adjustable S ..... 35&5%
Adjustable S Pipe 40%
Brigg's Pattern ..... 30&10%
Combination Black ..... 40&5%
Combination Bright 40%
Cylinder or Gas Pipe 55%
Extra Heavy 45%
Merrick's Pattern 50%
No. 3 Pipe, Bright 55%
Boardman's 33⅓%
Coes' Genuine ..... 40&10&5&5%
Coes' "Mechanics" ..... 40&10&10&5&5%
Donohue's Engineer ..... 40&10%
Dudly Auto ..... 50&5@50&10%
Eagle ..... 50&10%
Elgin Wrenches 40%
Elgin Monkey Wrench Pipe Jaws 33⅓%
Gem Pocket 30%
Hercules 70%
W. & B. Machinist:
Case lots ..... 50&10%
Less than case lots ..... 50&5%
Improved Pipe (W & B.) 60%
Solid Handles, P.S. & W ..... 50@50&7½%
Stillson 65%
Triumph ..... 60&10%
Vulcan Chain 50%

Fruit Jar—
Triumph Fruit Can Wrenches, ₱ gro. $19.20
Syrup Cap Wrenches ..... ₱ gro. $8.00
T & B Fruit Jar Wrenches, ₱ gro $16.50
T & B Fruit Jar Holders, ₱ gro. $30.00

Wrought Goods—
Staples, Hooks, &c., list March 17 '02 ..... 70@70@90c&5%

Yokes Neck—
Covert Saddlery Works, Trimmed 70%
Covert Saddlery Works, Neck Yoke Centers 70%

Yokes, Ox, and Ox Bows—
Fort Madison's Farmers & Freighters' .. list net

Zinc—
Sheet ..... lb 7 @7¼¢

PAINTS, OILS AND COLORS—Wholesale Prices.

White Lead, Zinc, &c.
Lead, English white, in Oil ..... 7 @ 9¾
Lead, American White, in Oil:
Lots of 500 ℔ or over ..... @ 6¾
Lots less than 500 ℔ ..... @ 7¼
Lead, White, in oil, 25 ℔ tin pails, add to keg price ..... @ ⅛
Lead, White, in oil, 12½ ℔ tin pails, add to keg price ..... @ 1
Lead, White, in oil, 1 to 5 ℔ assorted tins, add to keg price ..... @ 1½
Lead, American, Terms: For lots 12 tons and over ¼¢ rebate; and 2% for cash if paid in 15 days from date of invoice; for lots of 500 lbs. and over 2% for cash if paid in 15 days from date of invoice; for lots of less than 500 lbs. net.
Lead White, Dry in bbls ..... 5¾@ 6¼
Zinc, American, dry ..... ₱ ℔ 4¾@ 4¾
Zinc, Paris, Red Seal, dry ..... @ 8¾
Zinc, Paris, Green Seal, dry ..... @ 9¾
Zinc, Antwerp Red Seal, dry ..... @ 7¾
Zinc, Antwerp, Green Seal, dry .. @ 8¾
Zinc, V. M. French, in Poppy Oil, Green Seal:
Lots of 1 ton and over ..... 12 @12½
Lots of less than 1 ton ..... 12¼@12¾
Zinc, V. M. French, in Poppy Oil, Red Seal:
Lots of 1 ton and over ..... 10¾@11¼
Lots of less than 1 ton ..... 11@11½
Discounts.—V. M. French Zinc.—Discounts to buyers of 10 bbl. lots of one or assorted grades, 1%; 25 bbls., 2%; 50 bbls., 4%.

Dry Colors.
Black, Carbon ..... ₱ ℔ 7 @11
Black, Drop, Amer ..... 4 @ 7
Black, Drop, Eng ..... 7 @15
Black, Ivory ..... 15 @21
Lamp, Com ..... 4½@ 6
Blue, Celestial ..... ₱ ℔ 4 @ 6
Blue, Chinese ..... 29 @32
Blue, Prussian ..... 27 @30
Blue, Ultramarine ..... 3½@15
Brown, Spanish ..... ½@ 1
Brown, Vandyke, Amer ..... 1½@ 2½
Brown, Vandyke, Foreign ..... 2½@ 3½
Carmine, No. 40 ..... ₱ ℔ $2.50@2.50
Green, Chrome, ordinary ..... 3½@ 6
Green, Chrome, pure ..... 17 @25
Lead, Red, bbls. ½ bbls. and kegs:
Lots 500 ℔ or over ..... @ 6¾
Lots less than 500 ℔ ..... @ 7¼
Litharge, bbls. ½ bbls. and kegs:
Lots 500 ℔ or over ..... @ 6¾
Lots less than 500 ℔ ..... @ 7¼
Ocher, French Washed ..... 5 @ 7
Ocher, Dutch Washed ..... 5 @ 7
Ocher, American ..... ₱ ton $10.00@18.00
Orange Mineral, English ..... ₱ ℔ 8½@ 9½
Orange Mineral, French ..... 10½@11½
Orange Mineral, German ..... 8½@9½
Orange Mineral, American ..... 8½@ 8½
Red, Indian, English ..... 4½@ 8½
Red, Indian, American ..... 3 @ 3½
Red, Turkey, English ..... 4 @ 6
Red, Tuscan, English ..... 7 @10
Red, Venetian, Amer. ₱ 100 ℔ ..... 50@1.50
Red Venetian, English, ₱ 100 ℔ 1.50@1 75
Sienna, Italian, Burnt and Powdered ..... ₱ ℔ 3½@ 7½
Sienna, Ital., Raw, Powd ..... 3½@ 7½
Sienna, American, Raw ..... 1½@ 2
Sienna, American, Burnt and Powdered ..... ₱ ℔ 1½@ 2
Talc, French ..... ₱ 100 ℔ $1.25@1.50
Talc, American ..... .85 @1.10
Terra Alba, French, ₱ 100 ℔ ..... .95 @1.00
Terra Alba, English ..... .95 @1.00
Terra Alba, American No. 1 ..... .85 @.85
Terra Alba, American No. 2 ..... .45 @.50
Umber, Turkey, Bnt. & Pow. ₱ ℔ 2½@ 3½
Umber, Turkey, Raw & Powd. 2½@ 3½
Umber, Bnt. Amer ..... 1½@ 2
Umber, Raw, Amer ..... 1½@ 2
Yellow, Chrome ..... 11 @14
Vermilion, American Lead ..... 10 @.50
Vermilion, Quicksilver, bulk ..... @70
Vermilion, Quicksilver, bags ..... @71
Vermilion, English, Import ..... .80 @ 5
Vermilion, Chinese ..... .$1.05@1.20

Colors in Oil.
Black, Lampblack ..... 12 @14
Blue, Chinese ..... 36 @40
Blue, Prussia ..... 32 @36
Blue, Ultramarine ..... 13 @16
Brown, Vandyke ..... 11 @14
Green, Chrome ..... 10 @15
Green, Paris ..... @24
Sienna, Raw ..... 12 @15
Sienna, Burnt ..... 14 @15
Umber, Raw ..... 11 @14
Umber, Burnt ..... 11 @14

Miscellaneous.
Barytes, Foreign, ₱ ton ..... $19.00@21.00
Barytes, Amer. floated ..... 18.50@20.00
Barytes, Crude, No. 1 ..... 9.00@10.00
Chalk, in bulk ..... ₱ ton 3.25@ 3.50
Chalk, in bbls ..... ₱ 100 ℔ .@ 35
China Clay, English ..... ₱ ton 11.00@17.00
Cobalt, Oxide ..... ₱ 100 ℔ 2.25@ 2.50
Whiting, Common ..... ₱ 100 ℔ .45@ .55
Whiting, Gliders ..... .62@ .68
Whiting, extra Gilders' ..... .65@ .72

Putty.
In bladders ..... 1¾@2½
In bulk ..... 1½@2
In cans 1 ℔ to 5 ℔ ..... 2½@4½
In cans 12½ ℔ to 25 ℔ ..... 1½@2¼

Spirits Turpentine.
In Southern bbls ..... 49½@50 ¢
In machine bbls ..... 50 @50½¢

Glue.
Cabinet ..... ₱ ℔ 11½@14
Extra White ..... 18 @23
French ..... 12 @40
Irish ..... 13½@16
Low Grade ..... 9 @12
Medium White ..... 14½@16½

Animal, Fish and Vegetable Oils.
Linseed, City, raw ..... ₱ gal. .44 @ 45
Linseed, City, boiled ..... 46 @47
Linseed, State and West'n, raw ..... 42 @ ..
Linseed, raw Calcutta see t ..... 75 @ ..
Lard, Prime ..... 74 @75
Lard, Extra No. 1 ..... 58 @60
Lard, No. 2 ..... 45 @46
Cotton-seed, Crude, f.o.b. mills ..... 29½@32
Cotton-seed, Summer Yellow, prime ..... 41 @41½
Cotton-seed Summer Yellow, off grades ..... 38 @38½
Sperm, Crude ..... @ ..
Sperm, Natural Spring ..... 67 @68
Sperm, Bleached Spring ..... 68 @69
Sperm, Natural Winter ..... 70 @72
Sperm, Bleached Winter ..... 72 @74
Tallow, Prime ..... 55 @56
Whale, Crude ..... @ ..
Whale, Natural Winter ..... 46 @47
Whale, Bleached Winter ..... 48 @49
Menhaden, Brown, Strained ..... 30 @31
Menhaden, Light Strained ..... 32 @33
Menhaden, Bleached Winter ..... 34 @35
Menhaden, Ex Bleached Winter ..... 36 @37
Cocoanut, Ceylon ..... 5½@5¾
Cocoanut, Cochin ..... @ ..
Cod, Domestic ..... 35 @37
Cod, Newfoundland ..... 40 @ ..
Red Elaine ..... 45 @48
Red Saponified ..... ₱ ℔ 5 @ 5¼
Olive, Italian, bbls ..... 55 @ 60
Neatsfoot, prime ..... 57 @58
Palm, prime, Lagos ..... ₱ ℔ 5½@ 6

Mineral Oils.
Black, 20 gravity, 25@30 cold test ..... ₱ gal. 13 @14
Black, 29 gravity, 15cold test. 13½@14½
Black, summer ..... 12½@13½
Cylinder, light filtered ..... 20½@21½
Cylinder, dark filtered ..... 18½@19½
Paraffine, 903-907 gravity ..... 13 @13½
Paraffine, 903 gravity ..... 13 @14½
Paraffine, 883 gravity ..... 11½@12
Paraffine, red, No. 1 ..... 15 @15½
In small lots ½¢ advance.

CURRENT METAL PRICES.

JUNE 10, 1903.

The following quotations are for small lots. Wholesale prices, at which large lots only can be bought, are given elsewhere in our weekly market report.

IRON AND STEEL—

Bar Iron from Store—

Refined Iron:	
1 to 1¾ in. round and square	₽ lb. @2.20¢
1½ to 4 in. x ⅜ to 1 in.	₽ lb. @2.10¢
1¼ to 4 in. x ¼ to 5-16	₽ lb. @2.40¢
Rods—⅜ and 11-16 round and square	₽ lb. @2.40¢
Angles:	Cts ₽ lb.
3 in. x ¼ in. and larger	2.30¢
3 in. x 3-16 in. and ⅛ in.	2.55¢
1½ to 2½ in. x ¼ in.	2.35¢
1½ to 2¾ in. x 3-16 in. and thicker	2.30¢
1 to 1¼ in. x 3-16 in.	2.35¢
1 to 1¼ x ¼ in.	2.40¢
⅞ x ¼ in.	2.55¢
⅞ x ¼ in.	2.65¢
⅝ x ¼ in.	3.45¢
½ x 3-32 in.	3.95¢
Tees:	
1 in.	2.80¢
1¼ in.	2.60¢
1½ in. and larger	2.50¢
Beams	2.50@3.00¢
Channels, 3 in. and larger	2.50@3.00¢
Bands—1½ to 6 x 3-16 to No. 8	₽ lb. 2.40¢
"Burden's Best" Iron, base price	₽ lb. 3.05¢
Burden's "H. B. & S. Iron, base price	₽ lb. 2.85¢
"Ulster"	₽ lb. 5.15¢
Norway Bars	3 75@4.25¢
Norway Shapes	4.00@4.50¢

Merchant Steel from Store—

	per lb
Bessemer Machinery	2.10¢
Toe Calk, Tire and Sleigh Shoe	2.30@3.00¢
Best Cast Steel, base price in small lots	7¢

Soft Steel Sheets—

¼ inch	2.50¢	No. 14	2.70¢
3-16 inch	2.50¢	No. 16	2.80¢
No. 8	2.50¢	No. 18	3.00¢
No. 10	2.50¢	No. 20	3.00¢
No. 12	2.60¢	No. 22	3.10¢

Sheet Iron from Store.

Black.

	One Pass, C. R. Soft Steel	G. R. Cleaned.
Nos. 14 to 16	₽ lb. 2.90	3.0 ¢
Nos. 18 to 21	₽ lb. 3.00	3.10¢
Nos. 22 to 24	₽ lb. 3.10	3.2 ¢
Nos. 25 and 26	₽ lb. 3.20	3.30¢
No. 27	₽ lb. 3.30	3.40¢
No. 28	₽ lb. 3.40	3.50¢

Russia, Planished, &c.

Genuine Russia, according to assortment	₽ lb. 11½@14¢
Patent Planished	₽ lb. A, 10¢; B, 9¢, net

Galvanized.

Nos. 14 to 16	₽ lb., 3.24¢
Nos. 18 to 20	₽ lb., 3.51¢
Nos. 22 to 24	₽ lb., 3.78¢
No. 26	₽ lb., 4.05¢
No. 27	₽ lb., 4.32¢
No. 28	₽ lb., 4.59¢
No 30	₽ lb., 5.67¢

No. 20 and lighter, 86 inches wide, 25¢ higher.

Foreign Steel from Store—

Best Cast	₽ lb. 15 ¢
Extra Cast	₽ lb. 18@20 ¢
Swaged, Cast	₽ lb. 10 ¢
Best Double Shear	₽ lb. 15 ¢
Blister, 1st quality	₽ lb. 13 ¢
German Steel, Best	₽ lb. 10 ¢
2d quality	₽ lb. 9 ¢
3d quality	₽ lb. 8 ¢
Sheet Cast Steel, 1st quality	₽ lb. 15 ¢
2d quality	₽ lb. 14 ¢
3d quality	₽ lb. 12 ¢
R. Mushet's "Special"	₽ lb. 46 ¢
" " "Titanic	₽ lb. 19 ¢
Hobson's Choice XX Extra Best	₽ lb. 35 ¢
Jessop Self Hardening	₽ lb. 45 ¢
Seamans' "Nelson" Steel	40 ¢
Hobson's "Soho" Special Self-Hardening	₽ lb. 43 ¢

METALS—

Tin—

Duty.—Pigs, Bars and Block. Free.	Per ₽
Banca, Pigs	30¾@30¾¢
Straits, Pigs	30¾@30¾¢
Straits in Bars	31 @31¼¢

Tin Plates—

American Charcoal Plates.

Calland Grade:	
IC, 14 x 20	$8.75
IX, 14 x 20	8.25
Melyn Grade:	
IC, 14 x 20	6.50
IX, 14 x 20	7.75
Allaway Grade:	
IC, 14 x 20	5.50
IX, 14 x 20	6.50

American Coke Plates—Bessemer—

IC, 14 x 20 .....108 ₽	$4.70@4.80
IX, 14 x 20	$ .00@6.25

American Terne Plates—

IC, 20 x 28	$9.50
IX, 20 x 28	$11.50

Copper—

DUTY: Pig, Bar and Ingot and Old Copper free. Manufactured, 2½¢ ₽ lb.

Ingot—

Lake	15¼¢
Casting	15 ¢

Sheet and Bolt—

March 12, 1903. Net.

Prices, in cents per pound. Sheet 30 x 60.

Not wider than	Not longer than	And longer than	64 oz. & over, golb. sheet, 30 x 60 and heavier.	36 oz. to 64 oz. 25 to 30 lb.	24 oz. to 32 oz. 18¾ to 25 lb.	16 oz. to 24 oz. 12½ to 18¾ lb.	14 oz. and 15 oz. 11 to 12½ lb.	12 oz. and 13 oz. 9⅜ to 11 lb.	10 oz. and 11 oz. 7½ to 9½ lb.	8 oz. and 9 oz. 6¼ to 7½ lb.	Lighter than 8 oz.
Ins.	Ins.	Ins.									
30	72	.....	20	21	21	21	21	23	24	27	30
30	96	72	20	21	21	21	23	24	27	30	
30	.....	96	20	21	21	21	23	27			
36	72	.....	20	21	21	21	23	25	28	31	
36	96	72	20	21	21	21	23	27	30		
36	120	96	20	21	21	22	24				
36	.....	120	20	21	20	23					
48	72	.....	20	21	22	23	25	28	31		
48	96	72	20	21	20	24	26	29			
48	120	96	20	21	23	25	29				
48	.....	120	20	22	24	27					
60	72	.....	20	21	22	24	27	32			
60	96	72	20	21	23	25	30				
60	120	96	20	22	24	27					
60	.....	120	21	23	25	29					
72	96	.....	20	22	24	29					
72	120	96	20	23	26	31					
72	.....	120	21	24	29						
108	96	.....	21	24	27						
108	120	96	22	25	28						
108	.....	120	23	26	30						
wider than 108	132	.....	24	27							
	.....	132	25	28							

Rolled Round Copper, ⅜ inch diameter and over, ₽ lb. 20¢.

Circles, Segments and Pattern Sheets, 3¢ ₽ lb. advance over price of Sheet Copper required to cut them from.

Cold or Hard Rolled Copper 14 oz. ₽ square foot and heavier, 1¢ ₽ lb. over the foregoing prices.

Cold or Hard Rolled Copper, lighter than 14 oz. ₽ square foot, 2¢ ₽ lb. over the foregoing prices.

All Polished Copper, 20 in. wide and under 1¢ ₽ lb. advance over the price for Cold Rolled Copper.

All Polished Copper, over 20 in. wide, 2¢ ₽ lb. advance over the price for Cold Rolled Copper.

Planished Copper—

1¢ ₽ lb. more than Polished Copper.

Copper Bottoms, Pits and Flats—

14 oz. to square foot and heavier, ₽ lb.	25¢
12 oz. and up to 14 oz. to square foot, ₽ lb.	26¢
10 oz. and up to 12 oz., ₽ lb.	27¢
Lighter than 10 oz., ₽ lb.	28¢

Circles less than 8 in. diameter, 2¢ ₽ lb additional

Circles over 13 in. diameter are not classed as Copper Bottoms.

Polished Copper Bottoms and Flats, 1¢ ₽ lb extra.

Copper Wire—

Hard and Soft Drawn—B. & S. Gauge.
List Feb. 20, 1901.

Nos.	0000 to 8 Base	9 and 10		11 and 12
		¼¢		½¢ ₽ lb adv.
Nos.	13	14	15	16
	¼¢	⅝¢	1¢	1½¢ ₽ lb adv.
Nos.	17	18	19	20
	1½¢	2¢	2½¢	2¾¢ ₽ lb adv

Seamless Brass Tubes—

Standard always Stubs' gauge, unless otherwise ordered.
Feb. 6, 1899. Net. Outside Diameter.

Stubs' W. G.	B. & S. W. G.	¼	5-16	⅜	7-16	½	9-16	⅝	¾	⅞	1	1¼	1½
4-11	3- 9	.....	.....	.....	.....	33	31	30	29	28	27	25	24
12	10	.....	.....	37	35	33	31	30	29	28	27	25	24
13	11	.....	.....	37	35	33	31	30	29	28	27	25	24
14	12	.....	41	37	35	33	31	30	29	28	27	25	24
15	13	.....	41	38	36	33	32	31	30	30	28	26	25
16	14	.....	43	39	37	34	33	32	31	30	29	26	25
17	15	.....	44	41	38	35	34	33	32	31	30	27	26
18	16	61	45	42	39	36	35	34	32	31	30	28	27
19	17	62	47	41	40	37	36	35	34	33	32	30	29
20	18-19	64	49	44	41	39	38	37	36	35	34	32	31
21	20	66	51	46	43	41	40	39	38	37	36	35	34
22	21	71	55	48	44	42	41	40	39	38	37	37	36
23	22	76	61	50	46	44	43	42	41	40	39	39	39
24	23	81	66	53	48	46	45	44	43	41	40	40	41
25	24	86	72	56	51	49	47	46	45	43	43	44	45

Copper Bronze and Gilding Tube, 3¢ ₽ lb additional

Iron Pipe Sizes—Brass

¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6 inch
36	32	29	27	21	21	21	21	21	21	20	23	25	27	29½ ₽ lb

Copper, Bronze or Gilding Tubes, 3¢ ₽ lb additional.

Brazed Brass Tubing.

(*To No. 19, inclusive.*) June 6, 1898.

Brown & Sharpe's gauge standard.

	Per lb.
Plain Round Tube, ¾ in. up to 2 in.	$0.35
" " ⅝ " ¾ "	.36
" " ½ " ⅝ "	.38
" " ⅜ " ½ "	.41
" " 5-16 " ⅜ "	.48
" " ¼ " 5-16"	.65
" " 3-16 " ¼ "	1.00
" " ⅛ " 3-16"	1.50
Smaller than ⅛ inch	Special
2 inch to 3 inch, to No. 19, inclusive	.38
3 inch	.40
Over 3 inch to 3½ inch, inclusive	.45
Over 3½ inch	.50

Bronze and Copper, advance on Brass List, 3 cents.
Discount from list 25%

Roll and Sheet Brass—

(*Brown & Sharpe Standard Gauge.*)

Common High Brass Wider than and including	in. 2 12	in. 12 14	in. 14 16	in. 16 18	in. 18 20	in. 20 22	in. 22 24	in. 24 26
To No. 20 inclusive	.22	.23	.25	.27	.29	.31	.33	.36
Nos. 21 22, 23 and 24	.22	.24	.26	.28	.30	.32	.34	.37
Nos. 25 and 26	.23	.24½	.27	.29	.31	.33	.35	.38
Nos. 27 and 28	.23	.25	.28	.30	.32	.34	.33	.39
Common High Brass Wider than and including	in. 26 28	in. 28 30	in. 30 32	in. 32 34	in. 34 36	in. 36 38	in. 38 40	in. 40
To No. 20, inclusive	.39	.42	.46	.50	.55	.60	.65	*
Nos. 21, 22, 23 and 24	.40	.43	.47	.51	.56	.61	.68	
Nos. 25 and 26	.41	.44	.48	.52	.57	.63	.71	
Nos. 27 and 28	.42	.45	.49	.53	.58	.65	.75	

* Special prices not less than 80 cents.

Add 1¢ ₽ lb additional for each number thinner than Nos. 28 to 38 inclusive. Discount from List 25%

Wire in Coils. List February 26, 1896.

Brown & Sharpe's gauge the standard.	Com. high brass.	Low brass.	Gilding bronze and copper
All Nos. to No. 10, inclusive	$0.23	$0.27	$0.28
Above No. 10 to No. 16	.23½	.27½	.28½
No. 17 and No. 18	.24	.28	.32
No. 19 and No. 20	.25	.29	.33
No. 21	.26	.30	.34
No. 22	.27	.31	.35
No. 23	.28	.32	.36
No. 24	.30	.34	.38
No. 25	.32	.36	.40
No. 26	.35	.39	.43
No. 27	.38	.42	.46
No. 28	.42	.46	.51
No. 29	.45	.49	.54
No. 30	.48	.52	.62
No. 31	.51	.55	.67
No. 32	.55	.59	.73
No. 33	.59	.63	.82
No. 34	.64	.68	.95
No. 35	.70	.74	1.30
No. 36	.76	.80	1.50
No. 37	1.00	1.04	1.70
No. 38	1.30	1.34	2.00
No. 39	2.00	2.00	3.25
No. 40	2.60	2.60	5.75

Discount, Brass Wire, 25%; Copper Wire, Nat. List November 16, 96.

Spring Wire, 2¢ ₽ lb advance.

Tobin Bronze—

Straight, but not turned, Rods, ⅝ to 3 in. diameter, ₽ lb. net	19¢
Finished Piston Rods, ⅝ to 2½ in. diameter, ₽ lb net,	20¢

Other sizes and extreme lengths, special prices.

Spelter—

Duty: In Blocks or Pigs, 1¢ ₽ lb

Western Spelter	6@6½¢

Zinc.

Duty: Sheet, 2¢ ₽ lb.

No. 9, base, casks	7¼¢	Open, per lb	8¢

Lead.

Duty: Pigs and Bars and Old, 2½¢ ₽ lb. Pipe and Sheets, 2½¢ ₽ lb.

American Pig	4¾@5¢
Bar	5¾@5¾¢
Pipe	6¾¢ 20% off
Tin Lined Pipe	12½¢ 20% off
Block Tin Pipe	40¢ net
Sheet Lead	7¾¢ 20% off

Old Lead in exchange, 4¢ ₽ lb.

Solder.

½ & ¼, guaranteed	19½@20 ¢
No. 1	17 @18½¢

Prices of Solder indicated by private brand vary according to composition.

Antimony—

Duty, ¾¢ ₽ lb.

Cookson	₽ lb 8 @8½¢
Hallett's	₽ lb 7½@7¾¢
U. S.	₽ lb 7 @7½¢

Aluminum—

Duty: Crude, 8¢ ₽ lb., Plates, Sheets, Bars and Rods, 13¢ ₽ lb.

No. 1 Aluminum (guaranteed over 99% pure), in ingot for remelting:	
Small lots	₽ lb 37¢
100-lb lots	₽ lb 35¢
No. 2 Aluminum (guaranteed to be over 90% pure), in ingots for remelting:	
Small lots	₽ lb 34¢
100-lb lots	₽ lb 33¢

Aluminum Sheet, B. & S. gauge. 50 lb or more.

Wider than ... And including	6-in. 14-in. 14-in. 24-in.	24-in. 30-in.
	₽ lb.	₽ lb. ₽ lb
Nos. 13 to 19	$0.42	$0.44 $0.47
No. 20	.44	.46 .49
Nos. 21 to 23	.46	.48 .51
No. 24	.46	.50 .53
No. 25	.47	.51 .54
No. 26	.47	.54 .59
No. 27	.48	.57 .62
No. 28	.48	.57 .64
No. 29	.49	.60 .69
No. 30	.50	.64 .77

Note.—Lots of less than 50 lb 5¢ ₽ lb extra.

Aluminum Wire, B. & S. Gauge.

Larger than No. 9	₽ lb 40¢	No. 15	₽ lb 43¢
No. 9 to No. 10	₽ lb 40½¢	No. 17	₽ lb 50¢
No. 11	₽ lb 41 ¢	No. 18	₽ lb 55¢
No. 12	₽ lb 41½¢	No. 19	₽ lb 60¢
No. 13	₽ lb 42 ¢	No. 20	₽ lb 65¢
No. 14	₽ lb 42½¢	No. 21	₽ lb 85¢

Old Metals.

Dealers' Purchasing Prices Paid in New York.

Heavy Copper	₽ lb 11¼¢
Light and Tinned Copper	₽ lb 10¾¢
Heavy Brass	₽ lb 8 ¢
Light Brass	₽ lb 6¼¢
Lead	₽ lb 3¾¢
Tea Lead	₽ lb 3¼¢
Zinc	₽ lb 4 ¢
No. 1 Pewter	₽ lb 18½¢
No. 2 Pewter	₽ lb 8½¢
Pure Aluminum, Sheet, ₽ lb	21¢
Cast Aluminum, ₽ lb	16¢
Tin Plate Scrap	₽ ton $4.50@5.00
Wrought Scrap Iron	₽ gross ton $14.50@15.00
Heavy Cast Scrap	₽ gross ton $14.00@14.50
Stove Plate Scrap	₽ gross ton $8.00@ 9.00
Burnt Iron	₽ gross ton $8.50@ 9.00